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EDITORIAL

THE FORTY-FOURTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

With a registration of nearly 300 delegates and a considerable number of visitors, the forty-fourth convention of the Association of Land-Grant Colleges and Universities, held in Washington, D. C., from November 17 to 19, 1930, achieved distinction as perhaps the largest gathering in the association's long history. Certainly it will rank among the most representative, as delegates were in attendance from every State and the Territory of Hawaii.

Size is by no means synonymous with success, but the showing at this convention may nevertheless be considered both encouraging and significant. It indicates anew the strength of the association and demonstrates that its annual meetings are much more than routine affairs. It serves to deepen the belief that despite wide differences in organization, enrollments, and resources the land-grant colleges and universities are not a heterogeneous collection of educational units with little in common save the drawing of a relatively small portion of their income from the Federal Treasury, but a group of institutions organized and operated for the attainment of well-defined and specific objectives, possessing marked solidarity, and rendering as a whole a distinctive and increasingly valuable service in the education and upbuilding of the Nation.

The Washington convention was especially indicative of the present-day status of such matters, partly because an unusual amount of its attention was centered upon them. It received the first official announcement of the findings of the long awaited survey of the land-grant colleges and universities which has been carried on by the Federal Office of Education, and it furnished the first opportunity for these institutions as a whole to consider some far-reaching modifications of national policy in education which have been suggested by the National Advisory Committee on Education.

A timely and appropriate introduction to some of these matters was provided in the presidential address of President A. M. Soule

of Georgia at the opening of the general ses… took for his subject Contributions of the Land-… Universities to Our Social and Economic Progr… strated for these institutions an impressive record. With an average productive period of less than half a century, they may already, he declared, "be fairly and justly regarded as one of the Nation's foremost educational enterprises and as having contributed in a most efficient and essential manner to the social uplift and progress of the people of the United States. . . . It is evident that a great group of carefully selected and soundly trained scientific, technical, and professional experts is being annually turned out by the land-grant colleges and universities to promote and expand our educational activities as they relate to teaching, research, and extension service. That these benefits will not accrue merely to our rural citizenry is clear to every competent thinker. Undoubtedly they have already exercised a benign influence on the more satisfactory coordination of our production and marketing enterprises and therefore beneficially affected the development programs of our commerce and the industries dependent on agriculture. This in turn has helped to raise the living standards of our urban dwellers and determine in a measure at least many of our international trade objectives and relationships. It is correct, therefore, to again state that the welfare enterprises which our land-grant colleges and universities have been safeguarding and promoting reach from the center to the circumference of our country and wholesomely serve every interest resident therein."

Speaking more specifically of their accomplishments, he showed that for the single fiscal year ended June 30, 1928, nearly 27,000 men and women received degrees from these institutions, and that in the field of public secondary education alone over 2,000 professionally trained teachers for the rural high schools were made available. In less than two decades they are credited with having prepared and sent into active service approximately 14,000 workers in the fields of agricultural extension and research.

President Soule reviewed the substantial contributions of the colleges and experiment stations to improved farm and home practice and along economic lines, and concluded that they richly deserve the further indorsement and the more generous support of both the State and Federal Governments, with which their work is so closely associated and so happily integrated.

"Under the guidance of divine Providence," he declared, "we have fortunately put our hands to the plow and developed a group of institutions peculiar to the needs and requirements of our civilization. They are entirely in harmony with the democratic principles by which our people have always been actuated. Hence, it can be

nfidence that no proposition calculated tinued support and operation of our land- versities along the lines so successfully fol- ast 50 years will be tolerated by the people of a nation which they have so conscientiously, faithfully, and efficiently served."

The findings as to the land-grant college survey were presented by Dr. A. J. Klein, who had been actively concerned with this tremendous undertaking from its inception in 1927 to the completion of the final report of about 2,000 pages. This report has now been issued by the Office of Education in two comprehensive volumes, with provision for separates of the various sections. It is hoped to discuss the report and some of its findings, notably as regards research, in later issues of the *Record*.

The National Advisory Committee on Education and its recommendations were discussed on behalf of the committee by President George F. Zook of the University of Akron and for the association's special committee of cooperation by President George W. Rightmire of Ohio State University. These recommendations as thus far formulated and made public deal largely with the policy of Federal subsidies for education and their control. It is proposed, for instance, that the various laws extending Federal aid to the States for agricultural education, research, and extension be repealed and that no further grants be made to any special type of education; that in lieu of these grants greatly increased appropriations be made to the States on the basis of $2.50 per annum for each child under 21 years of age; that no matching of Federal funds be required; and that the States be empowered to expend their quotas for such educational purposes as they may individually decide upon, making ultimately their own allocations as between institutions and the various grades and types of education and including an apportionment as between resident instruction, research, and extension.

This radical innovation in policy was advocated by President Zook largely on philosophical and theoretical grounds as a decentralization tending toward restoration of the powers of the States. It was combated vigorously by President Rightmire, who contended that initiative for the development of industrial education had been taken by the Federal Government through the passage of the Morrill Act and supplementary legislation; that such special aid was not class legislation but was justified because of the basic nature and national importance of agriculture and the mechanic arts, resulting, as Dr. W. O. Thompson subsequently expressed it, in "a new type of education arising out of the economic necessity of the country"; that the Federal Government had consistently maintained its interests in the funds so appropriated; and that the practical workings of the

system in force for over half a century had soundness and economic value to the Nation. O is one of direct and vital concern to the land-grant if the adoption of so far-reaching a project in its present form is contemplated its influence upon their status and future development will be a factor worthy of careful consideration.

For several years an outstanding theme in the convention program has inevitably been the economic status of agriculture and the responsibilities of the land-grant institutions in ameliorating the situation. The recent convention was no exception in this respect. Addresses before the general sessions by the Secretary of Agriculture, the chairman of the Federal Farm Board, the president of the American Farm Bureau Federation, and the executive secretary of the American Engineering Council dealt almost exclusively with the current depression and its bearings upon agriculture, and both of the joint sessions of the section on agriculture were centered upon the immediate problem of economic readjustments in an agricultural improvement program under the existing conditions.

Expressions of appreciation of the association's assistance in this direction were tendered by several of the speakers. Both Secretary Hyde and Chairman Legge in particular commended the agricultural colleges and experiment stations for their services as fact-finding agencies and their intimate contacts with farming people. Chairman Legge emphasized the need of education in the fundamental principles of cooperation as vital to the success of this form of enterprise, and both speakers stressed the opportunity open to the extension service as trusted advisers in helping to decrease the surplus in many farm products by a comprehensive reorganization of production along more rational lines.

The economic discussion in the section on agriculture covered several phases of the agricultural situation in a more or less technical way. This was particularly true of the intricate question of farm taxation and the methods of studying it, dealt with at considerable length by Dr. M. S. Kendrick of Cornell University and Prof. G. W. Forster of North Carolina. The general problem of economic readjustments of American agriculture was considered by Dr. H. R. Tolley of the Giannini Foundation, who saw in the existing situation the greatest challenge that has ever come to research and extension agencies, and the part which legislation should be expected to play in bringing about readjustments was discussed from a constructive point of view by Hon. Victor Christgau, Member of Congress from Minnesota. Both of these speakers indicated that the development of economic research was among the few remedies brought forward giving promise of permanent benefit. That this

..ental character was also made clear in ..glund of the U. S. D. A. Bureau of Agricul- ... relation of State research and extension ...ment was explained by Vice Director Andrew Boss of Minnesota and Dean H. W. Mumford of Illinois, and that of agricultural extension as affected by recent economic trends by Dr. C. W. Warburton, U. S. D. A. director of extension work, and Dr. C. E. Ladd, director of extension at Cornell University. The economic discussions were appropriately supplemented by a consideration of standards of living as a basis for an extension program by Miss Madge J. Reese of the U. S. D. A. Extension Service.

The remaining sectional and subsectional programs included a variety of papers on instruction, research, and extension. Following the practice of recent years discussion of the research aspects is reserved for a later issue of the *Record*. Space consideration precludes detailed analysis of the contributions on other subjects, but special mention should be made of the numerous papers looking toward the improvement of college and extension teaching, farm organizations, the use of electricity on farms and other agricultural engineering problems, the need for more Federal funds in teaching agriculture in the land-grant colleges, and the next step in club work.

As at most Washington meetings, the opportunity for contacts with various Federal agencies and officials constituted a valuable phase of the convention. It was the occasion for the first appearance before the association of the Secretary of the Interior, Hon. Ray Lyman Wilbur, whose address dealt largely with the significance and importance of the White House Conference on Child Health and Protection. The address of the Commissioner of Education, Dr. William John Cooper, took up the subject of educational broadcasting, to which he has been devoting considerable personal attention. Dr. Cooper's frank discussion of the increasing complexities of the radio situation and the need for prompt and intelligent action if this means of enlightenment is to continue to be readily available for educational broadcasting intensified interest in this timely and important subject. He announced that following a recent meeting of educators in Chicago an attempt is to be made by a special committee, on which the association will be represented, to obtain reservation of 15 per cent of the available channels for such purposes.

To a considerable extent the exceptional attendance was augmented by the meeting during the week of a number of auxiliary societies and other groups. In accordance with a plan authorized at the 1929 convention, the opening session was advanced from Tuesday to Monday. This permitted the ending of the sessions on Wednesday and the attendance of many of the delegates at the

White House Conference on Child Health
followed from November 20 to 22. During t
also held of the American Association for the Advancem...
cultural Teaching, the American Association of Soil Survey Workers, and the American Society of Agronomy.

Another innovation was the condensation of the program by terminating the general sessions on the second day, and closing on the morning of the third day with sectional meetings and, simultaneously, a session of the executive body. This plan brought all business to an end at an earlier stage than for many years, and presumably was helpful to the executive body by placing at its disposal the entire morning for its final business. On the other hand, it increased the difficulties of the numerous individuals who were interested in attending the various sections but who also represented their institutions in the executive body. It also curtailed to some extent the opportunities for effective group recommendations as to matters of policy by the various sections and subsections and especially by the general sessions by shortening the time for their consideration in season for presentation to the executive body.

The general sessions were brought to a close with an appropriate word from a former leader in the association's work, Dr. W. O. Thompson, president emeritus of Ohio State University. Brief tribute had earlier been paid by Dean J. L. Hills of Vermont to the memory of another leader absent for the first time since 1905, the late President Howard Edwards of Rhode Island, whose counsel was recalled as consistently "timely, just, and constructive."

For the ensuing year the presidency of the association was bestowed upon President Rightmire of Ohio, while President E. O. Holland of Washington was chosen vice president. Dean T. P. Cooper of Kentucky was reelected secretary-treasurer, with the understanding that Dean C. A. McCue of Delaware would again edit the convention proceedings. The association continued to avail itself of the wide knowledge and long experience of Dean J. L. Hills of Vermont and President R. A. Pearson of Maryland by retaining them as assistant treasurer and as chairman of the executive committee, respectively.

Decision as to the week during which the 1931 convention will be held was as usual intrusted to the executive committee. Under the plan in operation for several years the convention is scheduled to be held in Chicago, Ill.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Capillary chemistry, I, H. FREUNDLICH (*Kapillarchemie. Leipzig: Akad. Verlagsgesell., 1930, 4 rev. ed., vol. 1, pp. VIII+566, figs. 97*).—This book, of which the first volume of the fourth edition is here noted, is described as a presentation of the chemistry of the colloids and of related fields.

The first section of the volume has the main divisions of liquid-gas interfaces, liquid-liquid interfaces, solid-gas interfaces, solid-liquid interfaces, capillary electrical phenomena, and the properties of interface layers. Section 2 deals with the kinetics of the formation of new phases, and section 3 similarly treats the Brownian movement.

The properties of starch with relation to time of formation of starch gels, O. W. CHAPMAN and J. H. BUCHANAN (*Iowa State Col. Jour. Sci., 4 (1930), No. 4, pp. 441–450*).—The data and observations recorded showed a drop following the attainment of the maximum value of the viscosity of starch pastes, and the gels formed from the pastes were found to show syneresis. Both effects are attributed to "a rearrangement of gel aggregates which liberates some of the water inclosed by the original structure. Starch pastes of low concentration do not form as firmly bound gel aggregates as those of higher concentrations, and so are less viscous, and since their movement is less hampered there is a greater degree of syneresis. Syneresis may be prevented or retarded by the addition of certain salts. This effect is believed to be due to the formation of firmer gel structures, which do not readily enter into rearrangements permitting the expression of water."

Hydrolysis of pectin by various microorganisms, G. A. PITMAN and W. V. CRUESS (*Indus. and Engin. Chem., 21 (1929), No. 12, pp. 1292–1295, fig. 1*).—The authors of this contribution from the University of California found, among other observations recorded, that "the pectinase activity of representatives of the more important groups of microorganisms occurring on fruits was determined for one set of conditions—namely, aerobic growth of the organisms at room temperature in or on apple juice containing added apple pectin. Of the microorganisms tested, two molds, *Penicillium glaucum* (*P. expansum*) and a *Pythium* sp. exerted the greatest hydrolytic action. . . . The *Pythium* sp. destroyed practically all of the pectin in 12 weeks' incubation at approximately 20° C. . . . *Bacillus aceti* and *B. amylovorus* had little effect under the experimental conditions. Yeasts, *Saccharomyces cerevisiae*, several strains of Mycoderma, and *S. ellipsoideus* from grapes had no noticeable effect on the pectin. . . .

"One organism had apparently not greatly reduced the quantity of pectin as shown by the Wichmann method, but it had changed its character so markedly that the 'pectin' refused to form a jelly under conditions where even lower concentrations of pectin from other cultures gave a firm jelly. The enzyme involved in the latter case was apparently pectase rather than pectinase. . . .

"The natural enzymes of apple tissue did not greatly reduce the pectin content during the period required for complete alcoholic fermentation of the sugars by *S. cerevisiae* at 35° C."

Studies on lignin and related compounds, I, II (*Canad. Jour. Research, 2 (1930), No. 6, pp. 357–375, fig. 1*).—The method of which the development and application form the subject of these two papers from McGill University "is not a quantitative one for analytical purposes but serves as a means of isolating, for physical and constitutional studies, the greater portion of those components of wood collectively known as lignin."

I. *A new method for the isolation of spruce wood lignin*, H. Hibbert and H. J. Rowley (pp. 357–363).—The spruce wood meal was extracted first with a mixture of equal volumes of alcohol and benzene, then with water, and finally with from 8 to 10 times its volume of ethylene glycol containing iodine amounting to 0.2 per cent of the weight of the wood meal. After filtration, the dissolved lignin was precipitated by pouring the solution into a large excess of cold water. "Other catalysts such as hydrochloric acid may be used in place of iodine, and the glycol may be replaced by a variety of hydroxy compounds such as glycol monoethyl ether, glycerol, chlorhydrins, hydroxyacids, etc."

II. *Glycol-lignin and glycol-ether-lignin*, H. Hibbert and L. Marion (pp. 364–375).—The wood meal was freed from resins and from water-soluble substances in the manner detailed in the first paper. For the extraction of the lignin as a glycol-lignin complex the pre-extracted wood meal was treated at from 100 to 103° C. with a 0.05 per cent solution of dry hydrogen chloride in ethylene glycol. Wood substance was dissolved to the extent of 27 per cent of the original weight. From the filtrate the lignin compound was precipitated in the form of a gray-brown colloidal substance representing 6 per cent of the total weight of the wood.

Repeated extractions were made, and "the curves obtained when these results are plotted . . . show that the lignin, pentosan, and even cellulose content decrease at the same rate. The fact that the lignin-pentosan ratio remains constant, both in the original wood meal and the residual extracted products, would seem to point to the conclusion that the lignin and pentosans are removed in an integral ratio, thus indicating the probable existence of a chemical combination between cellulose, lignin, and pentosans in the original wood."

Glycol monomethyl ether was substituted for the glycol in the extraction just noted, and again extraction took place with an apparent combination of the solvent with the extracted lignin. Methylation and hydrolysis and related experimental work led to the conclusion that "glycol-lignin is a condensation product of lignin with glycol, and that glycol-ether-lignin is a similar product involving lignin and glycol monomethyl ether, thus accounting for the appreciably higher methoxyl content of the latter compound. The results also suggest that the lignin may be present in the original spruce wood in combination with one or more of the other components (cellulose, the pentosans, hexosans, or other carbohydrates), and that the rôle of the solvent may be the replacement of one or more of these combined components by a glycol or a glycol monomethyl ether radicle. This would be a possible explanation of the similarity in the rates of removal of lignin and cellulose from wood."

The formylation of amino acids, R. E. Steiger (*Jour. Biol. Chem., 86 (1930), No. 2, pp. 695–702, figs. 2*).—A contribution from the Rockefeller Institute for Medical Research, the procedure, the apparatus, and the operative details being given in detail. The method permitted the complete

removal of the water formed in the reaction between formic acid and the amino acids investigated "by distillation in the presence of toluene, which is continuously reintroduced into the reaction flask of a suitable distilling device," a nearly complete reaction having thus been obtained.

Practically quantitative yields of the formyl derivatives of *d,l*-valine, *d,l*-leucine, and *d,l*-phenylalanine were prepared in this way. The analytical indices of the purity of these preparations and their corrected melting points are given.

The colour reactions and absorption spectra of sterols in relation to structure, I. M. HEILBRON and F. S. SPRING (*Biochem. Jour., 24 (1930), No. 1, pp. 133–135*).—"The Tortelli-Jaffé reaction has been modified so as to render it more sensitive" by carrying out the test in the following manner:

"A crystal of ergosterol is dissolved in glacial acetic acid (5 cc.) and 1 cc. of a 2 per cent solution of bromine in chloroform is introduced down the side of the tube by means of a pipette; a green ring appears at the surface of contact of the two solutions. Using these conditions, 0.02 mg. ergosterol can be immediately detected. The reaction is of peculiar importance, however, as the appearance of color occurs . . . in hydrogenated derivatives of ergosterol which do not respond to either the Rosenheim or $SbCl_3$ reagent."

As a result of the modification, "the reagent appears to be specific for sterol derivatives containing an 'inert' (as applied to hydrogenation) linkage, possibly in position $\Delta^{10:19}$. Selective absorption of sterols is conditioned by the presence of two ethenoid linkages in the molecule, one of which must apparently be in the $\Delta^{1:18}$ (or $\Delta^{1:2}$) position."

Semi-plant scale production of gluconic acid by mold fermentation, O. E. MAY, H. T. HERRICK, A. J. MOYER, and R. HELLBACH (*Indus. and Engin. Chem., 21 (1929), No. 12, pp. 1198–1203, figs. 6*).—The Color and Farm Waste Division, U. S. D. A. Bureau of Chemistry and Soils, reports the successful production on a semiplant scale of gluconic acid by the action of *Penicillium luteum purpurogenum* on solutions of commercial dextrose.

The investigation covered the effect of the surface-volume ratio, of subsurface agitation, and of H-ion concentration. High-grade aluminum was found a suitable material for fermentation pans, seven of which, each 108 by 108 by 5 cm., permitted the production of 36 kg. of gluconic acid in an 11-day cycle, this yield amounting to a little more than 57 per cent of that theoretically possible.

The maintenance of the organism, some details of the apparatus, the fermentation procedure, including the effect of the time factor on percentage yield, some cost data, and related details, are briefly discussed.

The preparation of glutathione from yeast and liver, N. W. PIRIE (*Biochem. Jour., 24 (1930), No. 1, pp. 51–54*).—The addition of a small proportion of ether to pressed yeast produced a mixture, in itself very difficult to filter but capable of improvement in this respect by the addition of sulfuric acid, which had "the further advantage of diminishing autoxidation in the filtrate. In the final method adopted a mixture of alcohol, ether, and sulfuric acid is used; the concentration of sulfuric acid must be high both on account of the great buffering power of yeast and also to prevent frothing which occurs in mixtures of yeast, alcohol, ether and insufficient sulfuric acid. This mixture filters somewhat slowly but centrifuges easily, and where the latter method of treatment is possible it is to be recommended. By this method the preparation of glutathione is remarkably easy and, using small quantities of yeast, crystalline glutathione may easily be obtained in 3 days."

The method is given in detail and a modification adapted to the extraction of glutathione from rabbit or ox liver is also outlined.

On the distribution of nickel and of cobalt in plants [trans. title], G. BERTRAND and M. MOKRAGNATZ (*Bul. Soc. Chim. France, 4. ser., 47 (1930), No. 3, pp. 326–331*).—A considerable number of fruits, vegetables, and other plant materials were examined, and all were found to contain determinable percentages of both nickel and of cobalt, though the quantities found were in all cases very small. The edible chanterelle (*Cantharellus cibarius*) gave the largest figure determined, nickel 3.5 and cobalt 2.13 mg. in 1 kg. of the dry substance.

Note upon the sulphur linkage in wool, C. RIMINGTON (*Biochem. Jour., 24 (1930), No. 1, pp. 205–207*).—Noting that "although the greater part of the sulfur present in wool-keratin can be accounted for as cystine . . . the actual state of combination of this amino acid is still a matter of considerable uncertainty," the author reports a series of experiments upon 0.05-gm. portions of grease-free and water-washed wool in which were noted the action of boiling water, of absolute alcohol, of a 5 per cent solution of formalin, of saturated hydrogen sulfide solution, and of ultra-violet radiation; of the enzymes trypsin in pH 8.0 solution and pepsin in pH 1.2 solution, and of 0.1 N sodium hydroxide solution alone; of *Bacillus subtilis* and of *B. mesentericus ruber* in both saline and broth cultures; and of the reducing agents sodium sulfite and sodium hydrosulfite, with and without added alkali, and cystine solutions containing sulfite, hydrosulfite, and sulfite with calcium oxide. The wool samples were tested in each case after the treatment for the disulfide, hydrosulfide, and Pauly reactions, and the results are indicated in a tabular statement.

It was concluded that "the sulfur groups of wool are less simple than those of free cystine. Free —S.S— or —SH groups are not present in undamaged wool and can only be induced by the action of alkalis or of ultra-violet radiation." It is further stated that "it would appear that in wool the cystine molecules are bound in some manner involving the sulfur groups and thereby depriving them of reactive freedom. Undenatured egg albumin presents a somewhat similar case, giving no nitroprusside reaction; on denaturation, however, by whatever means this is accomplished, a strong —SH reaction develops. . . . Blood serum, normally nonreactive, develops —S.S— groups on denaturation."

Applicability of the quinhydrone electrode to unsaturated acids, W. H. HATCHER and M. G. STURROCK (*Jour. Amer. Chem. Soc., 52 (1930), No. 8, pp. 3233–3235*).—Dihydroxymaleic acid was shown, in experiments briefly summarized in this note from McGill University, to be reduced in the presence of quinhydrone very rapidly to tartaric acid, with a corresponding upset of the quinone-hydroquinone equilibrium. From this observation it is concluded that "the quinhydrone electrode is not applicable to all unsaturated acids. From the standpoint of a study of this [dihydroxymaleic] acid the results are doubly interesting, since they indicate the reactivity of this double bond, heavily laden as it is with highly negative groups."

The variation of hydrogen ion concentration with carbon dioxide pressure above one atmosphere.—I, Colorimetric measurement, M. B. MOORE and J. H. BUCHANAN (*Iowa State Col. Jour. Sci., 4 (1930), No. 4, pp. 431–440, figs. 2*).—By means of a colorimetric method in which the comparisons were made in bottles capable of resisting the pressures required and by which readings to 0.1 pH were obtained, "the hydrogen ion concentration has been measured in CO_2 solutions at a series of pressures up to 33 atm. at 25°, and to 23 atm. at 0°. The pH of the solution was found to approach a limiting value between 3.3 and 3.2. This is probably no greater acidity than that due to the citric acid added in the majority of carbonated beverages. As citric

acid has been found to have no effect on the lower limit of pH obtained in CO_2 solutions under the highest pressures studied, the power of CO_2 to inhibit growth of organisms must be due, at least in part, to some factor other than the increase of hydrogen ion concentration in the solution."

Analytical methods in base exchange investigations on soils, C. J. SCHOLLENBERGER and F. R. DREIBELBIS (*Soil Sci., 30 (1930), No. 3, pp. 161–173, figs. 2*).—Following a short exposition of the various advantages of ammonium acetate as a base exchange salt, the authors of this contribution from the Ohio Experiment Station proceed to a discussion of leaching as a means of extracting exchanged cations, with special reference to ammonium acetate solution as extractant, and of the methods and apparatus found satisfactory.

Commercial ammonium acetate was found usually to contain about 1 mol of free acetic acid to each 2 mols of the neutral salt, so that it was considered more convenient to dilute, titrate, and make up to exactly twice normal, the quantities of ammonium hydroxide and acetic acid required and to check the accuracy of this operation by a determination of the pH (theoretically 7.0) of the resulting reagent. To insure maximum absorption of the ammonium ion the authors prefer an adjustment to pH 7.07 rather than to strict neutrality.

To remove excess ammonium acetate from the treated soil in preparation for the determination of the absorbed ammonium ion, neutralized 80 per cent alcohol was found satisfactory. Other details of the carrying out of the exchange reaction proper are discussed, and the individual determinations involved in the analysis of the solution of the exchangeable bases are then taken up in some detail under the heads of exchanged hydrogen, purification of the residue of salts, ammonium sulfide precipitation, calcium, magnesium, alkalies, aluminum, manganese, exchangeable ammonium, ammonium absorbed, correction for carbonates dissolved, and blanks.

A critical study of the methods for determining the nature and abundance of soil organic matter, S. A. WAKSMAN and K. R. STEVENS (*Soil Sci., 30 (1930), No. 2, pp. 97–116*).—Criticizing current methods, both of the alkali extraction and the oxidation type, for the determination of the organic matter content of the soil as giving results representative of "only a part of the soil organic matter, rarely more than 30 to 50 per cent," the authors of the present communication from the New Jersey Experiment Station propose to replace the attempt to determine the soil organic matter as a whole by the determination of the fractions (1) substances removed by successive extractions with ether and alcohol; (2) a carbohydrate fraction, determined as reducing sugars of acid hydrolysis; (3) a "protein" fraction, calculated from the nitrogen determination; and (4) a "lignin-humus" fraction, calculated from the carbon and nitrogen contents of the residue from the acid extraction made in determining the reducing sugars of hydrolysis.

The procedure is thus stated: "The soil . . . is air-dried, ground, and sieved. . . . The results should be calculated on an oven-dry basis. Total nitrogen and total carbon determinations are made on the air-dry material. The results of the analysis of the organic matter should be calculated on the per cent basis of the total organic matter of the soil. This is obtained by multiplying the organic carbon content of the soil by 1.72. This factor will probably be modified when considerable information has accumulated concerning the chemical composition of the soil organic matter. For the present, however, this factor is as satisfactory as any other one (2.0 for example) that might be suggested.

"Two 200-gm. quantities of the oven-dry soil are extracted with ether in Soxhlets for 10 to 16 hours. This is followed by hot alcohol extraction. The

extraction with a mixture (1:1) of benzol-alcohol may be employed, following the ether extraction, or may be used in place of both ether and alcohol extractions. The ether extract is evaporated to a small volume, then transferred to a weighing bottle; the residue carefully dried and the bottle weighed. The alcoholic extract is evaporated in weighed dishes. The amount of material (fats, waxes, and resins) soluble in ether and in alcohol is thus obtained. The extraction with benzol-alcohol mixture, in place of the ether and alcohol extractions, is carried out in a similar manner. The material extracted from soil by benzol-alcohol was found to be nearly equivalent to that extracted by ether and by alcohol.

"Fifty-gram quantities of the dried residual material are placed in beakers and treated with 25 cc. of 80 per cent sulfuric acid solution for 2.5 hours in the cold. Next, 375-cc. portions of distilled water are added to the beakers and the diluted acid extract is heated for 5 hours in flowing steam. The digest is filtered through dried and weighed papers, and the residue is washed thoroughly with water. The solution is made up to volume and the amount of reducing sugar (also total and ammonia nitrogen if desired) determined. The sugar serves as a measure of the total carbohydrate content of the soil organic matter.

"The residue from the acid extraction is dried and weighed. Two 5-gm. quantities from each residue are used for total carbon determinations, and two 10-gm. quantities are used for total nitrogen determinations. The 'lignin' or 'lignin-humus' complex is then calculated from the carbon and nitrogen content of this residue."

Reference is made to the senior author's previous work on the determination of "humus" (E. S. R., 56, p. 421) and to numerous other related studies.

The action of gaseous ammonia on phosphoric anhydride [trans. title], A. Sanfourche, A. Hernette, and M. Fau (*Bul. Soc. Chim. France, 4. ser., 47 (1930), No. 3, pp. 273–279, fig. 1*).—The action of ammonia gas on phosphoric anhydride was found to yield first the diammonium salt of amidopyrophosphoric acid; and the triammonium salt, easily, by the further action of ammonia. A good reaction was secured only when the gas was not absolutely dry. Extreme reduction of the moisture content did not alter the nature of the products but did reduce the yield almost to nothing. Hydrolysis of the amidopyrophosphates obtained more or less readily yielded the corresponding ammonium orthophosphates.

Ratio of fluorine to phosphoric acid in phosphate rock, D. S. Reynolds, K. D. Jacob, and W. L. Hill (*Indus. and Engin. Chem., 21 (1929), No. 12, pp. 1253–1256*).—The Division of Fertilizer and Fixed Nitrogen Investigations, U. S. D. A. Bureau of Chemistry and Soils, reports a study of the fluorine-phosphoric acid ratios in phosphate rock of the domestic types. Approximately constant ratios were found in the commercial grades of Western, Florida hard, and Tennessee blue- and brown-rock phosphates, "the ratios varying somewhat with the different types of rock."

"The approximate fluorine content of samples of these types of phosphate may be calculated from their phosphoric acid content by the use of the ratios given in this paper. The fluorine-phosphoric acid ratio in Florida land-pebble phosphate is not constant, but varies inversely with the phosphoric acid content. The percentages of fluorine are very constant in the different grades of this type of phosphate."

Figures are given for the fluorine-phosphoric acid ratios in Florida soft and waste-pond phosphates, and the relation between the fluorine content and the geological age of phosphate rock is discussed.

The arginase method for the determination of arginine and its use in the analysis of proteins, A. HUNTER and J. A. DAUPHINEE (*Jour. Biol. Chem., 85 (1930), No. 2, pp. 627–665, fig. 1*).—A detailed investigation reported from the University of Toronto indicates that "arginase is capable of producing from arginine 99.1 per cent of the theoretical amount of urea," and, further, that "under the action of the enzyme urease, urea has been found to yield 99.4 per cent of the theoretical amount of ammonia." The successive use of the two enzymes, together with a suitable correction, made possible the quantitative determination of arginine with an error said not to exceed 0.5 per cent; and methods designed to permit the accurate determination, on the principle indicated, of the arginine content of proteins are described. The arginine contents of gelatin, casein, edestin, gliadin, globin, fibrin, Witte's peptone, and of a commercial peptone preparation as determined by the arginase method are given.

Methods used for the preparation of highly active solutions of arginase are outlined, as is also a procedure for testing arginatic activity.

A study of the precipitation of the sugars and of the polyhedric alcohol in the form of a copper barium complex [trans. title], P. FLEURY and P. AMBERT (*Bul. Soc. Chim. France, 4. ser., 47 (1930), No. 4, pp. 420–435, figs. 6*).—As the alkali necessary to the reaction under consideration, barium hydroxide was found preferable to sodium hydroxide because of the tendency of the latter compound to bring about a colloidal dispersion of the cupric hydrated oxide. The precipitate obtained by the action of copper sulfate and barium hydroxide on a sugar solution was considered to be under conditions such that the copper present precipitated a maximal quantity of the sugar, a complex having a definite copper-sugar ratio established by virtue of the fixation of a certain proportion of barium in equilibrium with the concentration of the base remaining in the solution.

From the viewpoint of the practical application of the reaction, attention is directed to the possibility of obtaining, by adding to the sugar solution a large excess of barium hydroxide and a suitable quantity of copper sulfate (in excess of the ammonium determined by the nature and quantity of the sugar in each case), a practically quantitative precipitation of the sugars present. The copper and barium could subsequently be removed quantitatively from this precipitate, leaving the sugars in almost pure solution.

METEOROLOGY

Manual of meteorology.—Vol. III, The physical processes of weather, N. SHAW and E. AUSTIN (*Cambridge, Eng.: Univ. Press, 1930, vol. 3, pp. XXVIII+445, figs. 149; rev. in Nature [London], 126 (1930), No. 3168, pp. 86–88*).—Volumes 1, 2, and 4 of this series of manuals have previously been noted (E. S. R., 60, p. 113).

An introductory chapter discusses the physical processes of weather. Other chapters deal with gravity waves in water and air, sound waves, atmospheric optics, radiation and its problems, the controlling influences of radiation, air as workers, the liability of the environment, side light on convection and cloud, electrical energy in the atmosphere, and convection in the general circulation. There is also a table of symbols and a list of words used in special senses.

Discussing the relation of radiation to weather, the authors express doubt as to the scientific accuracy of the determinations of the solar constant from day to day and its dependability as a basis for weather forecasting. "We

must accordingly look in other directions for the expression of the influence of solar radiation upon weather."

Agricultural meteorology, P. HOLDEFLEISS (*Agrarmeteorologie. Berlin: Paul Parey, 1930, pp. VII+108, figs. 4*).—This book, based on many years of observation and study by the author, briefly defines the field and the fundamentals of agricultural meteorology and discusses the relation of crop yields to weather and climate, especially as applied to conditions in Germany, with a view to making meteorology more useful to agriculture.

Climate and lands [trans. title], S. PASSARGE (*Naturwissenschaften, 17 (1929), No. 51, pp. 994, 995; abs. in Deut. Landw. Rundschau, 6 (1930), No. 1, pp. 23, 24*).—Discussing the relation of climate to the character and utilization of lands, the author maintains that natural conditions have been materially modified by artificial influences such as drainage, changes in plant cover, and methods of culture, thereby creating a certain degree of disharmony in the relation of climate to lands.

Small climatic studies by means of temperature observation trips [trans. title], W. SCHMIDT (*Met. Ztschr. [Brunswick], 47 (1930), No. 3, pp. 92–106, figs. 5*).—Temperature observations at 20 cm. and 1.2 meters above the soil in the regions around Vienna, by means of a movable temperature installation, are discussed with reference to May frosts and crop growth.

Agricultural climatology of the territory of Perugia [trans. title], M. BRICCOLI (*Ann. Tec. Agr., 3 (1930), No. 4, I, pp. 465–527, pls. 2; Lat. abs., pp. 525–527*).—Observations on temperature, pressure, precipitation, relative humidity, and wind at the Central Observatory at Perugia, Italy, from 1900 to 1925, inclusive, are summarized, and the relation of the different meteorological elements to growth of various crops, particularly forage plants, wheat, corn, grapes, and olives, is discussed.

The relation between weather and the yield and quality of wheat, M. HADJI-ZADE (*Ueber die Beziehungen Zwischen dem Witterungsverlauf und der Höhe und Beschaffenheit des Weizenertrages. Inaug. Diss., Landw. Hochsch., Berlin, 1930, pp. [4]+139, pls. 8*).—The author presents data from which he concludes that all factors which increase the yield of wheat also increase the weight of the grain. Hot, dry seasons shorten the period from blooming to ripening and result in smaller and harder grain containing relatively less starch and more protein than that produced in cool, wet seasons.

Agricultural meteorological scheme: Precision records on wheat, 1928–30, J. A. RUDDERHAM and C. C. WEBSTER (*Jour. Southeast. Agr. Col., Wye, Kent, No. 27 (1930), pp. 216–219, figs. 2*).—This article reports a continuation of experiments previously noted (E. S. R., 61, p. 808). There is some interpretative analysis, but no especially significant generalizations are attempted at this early stage of the work.

West monsoon forecasting in behalf of the time of sowing tobacco in the Vorstenlanden [trans. title], D. TOLLENAAR (*Proefsta. Vorstenland. Tabak [Dutch East Indies], Meded. 67 (1930), pp. [2]+23, figs. 5; Eng. abs., pp. 22, 23*).—A method of forecasting based on the close and long-continued relation between air pressure deviation at Batavia and at Port Darwin and the beginning of the west monsoon in Java, which it is thought will greatly reduce the risks of tobacco planting in Java, is explained.

A preliminary study of crop yields and rainfall in the Transvaal, D. G. HAYLETT (*Transvaal Univ. Col., Pretoria, Bul. 19 (1930), pp. VI+61, pl. 1, figs. 8*).—This paper presents a preliminary study of crop requirements and availability of moisture under the climatic conditions of South Africa in general and of the Transvaal in particular. Specifically, it deals with an exam-

ination of data on corn yields and rainfall accumulated in the course of field experiments at the Experimental Farm of the Transvaal University College, Pretoria, during the past eight years.

The author concludes that "annual rainfall per se is a very poor guide to the agricultural possibilities of any area unless the extent of the modifying factors is also known." Various inhibiting factors, such as rainfall losses, poor distribution of rainfall, and the like, are discussed in their relation to potential rainfall and its effectiveness in crop production.

The results of the study indicate that "the monthly rainfall during the month of December is negatively correlated with yield, while the rainfall during the month of January is positively correlated. The typical distribution of rainfall in the Transvaal shows a natural dip for December. January is the month with the highest rainfall. But in spite of the normally high January rainfall the yield is more dependent on an adequate supply during this month than during any other. Under Transvaal conditions, January corresponds to the month of July in the Corn Belt of the United States. Rainfall during successive periods in the life cycle of the crop does not affect the ultimate yield to the same extent. The importance of sufficient moisture increases after planting and reaches a maximum during the period from flowering to two weeks after flowering. This is the main critical period of the maize crop. The rainfall prior to planting is important. Although not very great in quantity this rainfall determines the planting date. In general, planting does not take place until a total of 6 in. has fallen, with an average of 2 in. during the two weeks preceding planting. Thereafter, a lower rainfall is required, followed by an increasing amount up to the critical period after flowering."

Our rainfall: How is it formed and what becomes of it? G. F. McEwen (*Sci. Mo., 31 (1930), No. 5, pp. 385–400, figs. 17*).—This article discusses transportation of water vapor from ocean to land, conditions essential to precipitation, orographic and cyclonic rain and the polar front theory of storms, the return flow of water from land to sea, and evaporation from water and land surfaces, referring especially to the investigations of the Scripps Institution of Oceanography and the California Institute of Technology on evaporation. These resulted in the formulation of an equation based upon "the principle that the rate at which energy is removed by evaporation must equal the difference between the rate at which energy is supplied by solar radiation and lost by back radiation corrected for heat storage in the water," which it is stated has "led to a rational and accurate procedure for determining the evaporation from a lake."

SOILS—FERTILIZERS

Studies of soils in the plastic state, G. B. Bodman and M. Tamachi (*Soil Sci., 30 (1930), No. 3, pp. 175–195, figs. 8*).—By a refinement of the Atterberg method (E. S. R., 26, p. 220) "for measuring the moisture content of soils at the so-called 'Fliessgrenze' [fluidity threshold-value], and by consideration of the laws of flow of plastic solids developed by Bingham, a simple method was devised whereby the moisture content of soils may be compared at states of equal stiffness. Equal stiffness is defined as that consistency at which the application of an equal force produces in different soils an equal amount of flow. The method is described, and involves dropping a flat-bottomed, straight-sided, metal container, holding the plastic mass of soil of known moisture content, from a fixed height to a fixed, flat surface, until a ditch, previously excavated in the soil, is filled. By determining the number of impacts needed to fill the ditch at different moisture contents of the soil, and by graphically plot-

ting the results, hyperbolic curves were obtained in all cases. There was found to be a close positive correlation between the air-dry moisture content, the moisture equivalent, and the colloidal clay content, respectively, and the soil moisture content at states of equal stiffness. This proved true for all degrees of stiffness, and indicates that large quantities of water are bound by the soil colloidal material and that lubrication of the plastic mass is delayed when much colloidal matter is present.

"The effect of natural soil organic matter, among the soils used, appeared no different from that of inorganic colloidal material. The hydrogen-ion concentration of the soils was without any distinct effect upon the amount of moisture needed to produce a given stiffness."

Some chemical phases of submerged soil conditions, W. O. Robinson (*Soil Sci., 30 (1930), No. 3, pp. 197–217*).—The paper is a contribution from the U. S. D. A. Bureau of Chemistry and Soils in which are reported, among other data, the comparative iron and manganese contents of water extracts of well drained and poorly drained portions of an area of Congaree silt loam, the iron and manganese contents of certain bog waters, the development of soluble iron and manganese during submergence periods of 1, 8, 22, 60, and 80 days in a large number of soils, increase of solubility of various elements with time of submergence, the influence of carbon dioxide on the solubility of manganese, a comparison of the solubilities under air and under nitrogen of the iron and manganese contents of three soils exposed in 1 : 5 ratio to the action of water for 30 days, the reaction of certain soils and submerged soil solutions, determinations of some components of the gases evolved from submerged soils, etc. The conclusions stated include the following:

"Submerged soil solutions are radically different from aerated soil solutions in that they contain high concentrations of iron and manganese. The iron and manganese are present as proto bicarbonates. Submerged soil solutions are also high in calcium and magnesium and contain hydrogen sulfide and other sulfides. The high concentration of iron, manganese, calcium, and magnesium is caused indirectly by the microbiological action on the organic matter, which produces carbon dioxide along with other gases. It is the carbon dioxide that is mainly responsible for holding the iron, manganese, calcium, and magnesium in solution. In the absence of organic matter the solubility of iron, manganese, calcium, and magnesium is not increased under submerged soil conditions.

"Soils are not made more acid by submergence for short periods except by such acidity as is due to carbon dioxide and bicarbonates.

"All normal soils containing organic matter, when submerged, eventually produce gas. This gas production is retarded by blue-green algae of the Chlamydomonos group. When blue-green algae are absent, the gas consists mainly of methane and hydrogen. In the presence of the algae the hydrogen and part of the methane are decomposed. Under these conditions the gas is mainly nitrogen and carbon dioxide with variable quantities of methane. Soil organic matter in aerated soils disappears, in some instances very rapidly, when the soils are submerged.

"Submerged soil solutions develop toxic concentrations of ferrous iron, sulfides, and commonly manganese. Toxic concentrations of these elements are occasionally developed in bog waters and in solutions of poorly drained soils, and they are invariably developed in submerged soils protected from the air. Soils that have been submerged for a long time may be so profoundly leached of calcium, magnesium, manganese, and iron that they will not support plant growth. Toxic concentrations of ferrous iron and sulfides develop in a few days after submergence. Toxic concentrations of manganese develop somewhat more slowly."

Soil erosion in the silt loam uplands of Mississippi, G. H. LENTZ, J. D. SINCLAIR, and H. G. MEGINNIS (*Jour. Forestry, 28 (1930), No. 7, pp. 971–977*).—Of various factors concerned in soil erosion and which are presumed to account for differences in the severity of erosion in different sections of the State are listed (1) differences in temperature, (2) variations in depth of the loess soil, (3) changes in underlying strata, (4) frequency of fires, and (5) past farm practices. Each of these is discussed in relation to the problem.

The microflora of leached alkali soil, J. E. and J. D. GREAVES (*Bot. Gaz., 90 (1930), No. 2, pp. 224–230*).—The bacterial activity in the soils examined was found by the authors of this contribution from the Utah Experiment Station to be modified to an important extent by the presence of soluble salts.

"The numbers of bacteria ammonifying and nitrifying powers of the 'alkali soils' tested are not fully restored by mere leaching of the soil. The extent to which restoration takes place varies with the concentration and kind of salt present. With the soils tested it was found that leaching is less effective in the presence of chlorides than it is in the presence of sulfates. The leached alkali soils studied rapidly fix nitrogen when seeded into Ashby media, when incubated with a soluble carbohydrate, or when kept under optimum moisture and temperature conditions in the greenhouse. In promoting nitrogen fixation, the sulfates were found to be the most effective of the salts tested. Fifty-six per cent of the organisms obtained in pure culture from Ashby agar fixed nitrogen in soils containing mannitol, some of them fixing quantities which compare favorably with those fixed by Azotobacter. The beneficial bacteria of the soil survive for long periods in soils containing comparatively high concentrations of chlorides and sulfates."

Actinomycetes in Danish soils, H. L. JENSEN (*Soil Sci., 30 (1930), No. 1, pp. 59–77*).—The author reports from the State Laboratory of Plant Culture, Lyngby, Denmark, the method and results of counts of actinomycetes found in 56 Danish soils. The morphological and physiological characteristics of many of the forms isolated are given in detail.

The numbers ranged from none to 13,000,000 in 1 gm. of the soil. In almost all of the soils more acid than pH 5 numbers were very low. High counts appeared most frequently in the pH range 6.8 to 8. Actinomycetes constituted 73 per cent of the total microflora in some cases.

With respect to the species found and the general characteristics observed the following categories are set up:

"Common organisms—*Act. griseus, cellulosae, olivaceus, bobili, diastatochromogenus.* Fairly common to rare organisms—*Act. griseoflavus, violaceus-ruber, roseus, erythrochromogenus, pheochromogenus;*" and a new species-group, *Actinomyces fulvissimus* n. sp., is described.

"The majority of the strains could not be identified as belonging to definite groups. The different strains within the same species-group often show great differences in their physiological characters, such as pigment production, ability to utilize various carbohydrates, acid formation, nitrate reduction, and proteolytic activity, although some of these characters remained relatively constant and appeared to have diagnostic value. Organic acids were sometimes formed from carbohydrates; this was always connected with nitrite production. The 'chromogenous' forms had, upon the whole, a lower proteolytic power than the nonchromogenous. The ability of actinomycetes to resist acid reaction varied widely; the final acidity produced in a physiologically acid nutrient solution for each species-group was subject to less variation than most other physiological characters and may be of value for the characterization and identification of the different species-groups."

Some fermentation characteristics of various strains of Rhizobium meliloti and Rhizobium japonicum, R. H. WALKER and P. E. BROWN (*Soil Sci., 30 (1930), No. 3, pp. 219–229, fig. 1*).—Yeast-water-glucose and yeast-water-galactose cultures of 23 strains of *R. meliloti* and of 12 strains of *R. japonicum* were investigated at the Iowa State College with respect to the constancy of the fermentation characteristics of the individual strain, changes induced in the H-ion concentration of the medium constituting the principal criterion relied upon for the differentiation. "The results indicate that the fermentative powers of individual strains of these bacteria were approximately the same in the various consecutive tests, and that the fermentative ability of a particular strain of organisms is a comparatively constant character.

"The data also indicate clearly that there are large variations in the fermentation characters of different strains of the same species of legume bacteria. Some of the *meliloti* strains produced a distinctly alkaline reaction in the media, and others produced a strongly acid reaction in media of the same composition. Some strains made the media a hundred times as acid as other strains of the same species. Some of the *japonicum* strains produced a very slightly alkaline reaction in the media, whereas others produced a reaction almost ten times as alkaline." By reason of differences between individual strains of the same species, it is considered that "the fermentation test with glucose and galactose and under conditions similar to those followed in these experiments would not serve to give a distinct separation of organisms of these two species of legume bacteria."

Nitrogen fixation in field soil under different conditions of cropping and soil treatment, L. A. BRADLEY and J. E. FULLER (*Soil Sci., 30 (1930), No. 1, pp. 49–57*).—The Massachusetts Experiment Station here reports a microbiological investigation constituting a phase of its researches on the relation of the treatment of the soil to power of crop production (E. S. R., 34, p. 622; 47, p. 218). The work noted consisted in part in the quantitative study of the plat soils under investigation; the determination of the nitrogen-fixing ability of the organisms isolated and a morphological examination (which yielded the information that "the morphology of the organism, 9A, is typical for Azotobacter," that "in Ashby's solution or on Ashby's agar, cultures up to 1 week old show a predominance of diplococcus forms, somewhat granular when stained with erythrosin or rose bengal," and that "the cells are slightly smaller than those of three stock strains of *Azotobacter chroococcum* carried in the laboratory"; a study of the nitrogen-fixing ability of the soils of the plats; and a determination of the soil pH in the plats used.

"Results suggest that there is sufficient nitrogen fixation in the soil . . . to account for the nitrogen reserve. The nitrogen fixation observed in the plats is correlated with the presence of an Azotobacter strain designated as 9A. Nitrogen fixation and the distribution of organism 9A appear to have remained reasonably constant over a 3-year period. The growth of different crops, including legumes and nonlegumes, has not influenced nitrogen fixation or the presence of organism 9A in the field. . . . The soil reaction in the plats . . . does not appear to be a controlling factor in the nitrogen-fixing activity and the distribution of organism 9A; this organism tolerates a lower pH than that commonly accepted as a limiting factor for Azotobacter growth."

A comparison of some nodule forming and non-nodule forming legumes for green manuring, L. T. LEONARD and H. R. REED (*Soil Sci., 30 (1930), No. 3, pp. 231–236*).—The U. S. D. A. Bureau of Chemistry and Soils compared the effects as green manure crops of a number of leguminous species of each of the indicated types, using a slightly acid sandy loam soil (Orangeburg) and fol-

lowing up the green manure crop with oats as an indicator crop. A nonnodulated plant (*Cassia tora*) gave the largest, and Otootan soybeans, nodulated, gave the lowest yield of dry hay; but the indicator crop was light green on the *C. tora* plats, whereas it had a dark green color on the other plats. The turning under of the entire legume crop gave better results with the following indicator crop than did the turning under of the legume stubble only.

"Considering the data as a whole, no decided differences are shown between the after-effects of noduled or nonnoduled legumes."

Effect of calcium and phosphorus content of various soil series in western Washington upon the calcium and phosphorus composition of oats, red clover, and white clover, H. F. Holtz (*Washington Col. Sta. Bul. 243 (1930), pp. 45*).—Determinations of calcium and of phosphorus were made upon 100 soil samples representative of 17 series and of 4 varieties of geological origin, and the same elements were determined also in crops of oats and clover grown upon these soils.

Of the soil analyses the following are the results particularly noted: The lowest calcium content was found in a residual series (Olympic) and the highest in an alluvial series (Sacramento). The lowest phosphorus content was found in an upper glacial series (Whatcom), the highest in a glacial series (Spanaway). The residual and upper glacial series were low both in total and in available phosphorus. The lower glacial and alluvial series were relatively high both in calcium and in phosphorus.

Results of the corresponding crop analyses are thus stated:

"The calcium content of oats is closely proportional to that found in the residual, upper glacial, depression deposits, and organic soils, but in the other geological classes of soils no relation exists. The phosphorus content of oats follows the phosphorus content of the soil in each geological soil class, except in the residual and lower glacial. The phosphorus content of red clover follows the phosphorus content of the soil only in the case of organic soils. The phosphorus content of oats follows more closely the total phosphorus content of the soil, while that of red clover follows the available phosphorus content of the soil more closely.

"The calcium and phosphorus content of oats grown in western Washington is lower than that of oats grown in the eastern and mid-western States, while that of red clover is about the same in the three areas. A large number of samples of oats, and some of red clover, from western Washington are below the calcium and phosphorus content of feeds reported by numerous investigators as being responsible for nutritional deficiency diseases."

Phosphate studies in solution cultures, J. W. Tidmore (*Soil Sci., 30 (1930), No. 1, pp. 13–31, figs. 4*).—The rate of absorption of the phosphate ion from culture solutions, the growth rate and crop yields, the phosphate content of the plant and of the plant sap, and the buffer capacity of the plant sap as related to its phosphate content were taken up in the investigation of the Alabama Experiment Station here reported, the experimental procedure being stated in detail.

"Culture solutions of low phosphate concentrations were maintained very well by the use of a large volume of solution for each plant and by the addition of potassium acid phosphate at frequent intervals. The rate of PO_4 absorption was not directly proportional to the PO_4 concentration of the culture solution. The rate of growth increased with increasing phosphate concentrations throughout the growing period.

"Maximum growth of corn, sorghum, and tomatoes was obtained at 0.5 p. p. m. PO_4. Growth of corn and sorghum at 0.2 p. p. m. PO_4 was good, the dry weight

being about 71 per cent of the maximum. The dry weight of tomatoes at 0.2 p. p. m. was only 42 per cent of the maximum. Plants made a better growth in soil whose displaced solution contained from 0.02 to 0.03 p. p. m. inorganic PO_4 than in culture solutions at 0.1 p. p. m. PO_4. The phosphate content of plant and plant sap increased with increasing concentrations of PO_4 in the culture solutions. Tomatoes had a higher percentage of PO_4 than corn or sorghum, whereas the sap from corn and sorghum leaves had a PO_4 content higher than that of tomatoes.

"Phosphate played a minor rôle as a buffer material in the plant sap. Corn and wheat plants absorbed PO_4 more rapidly from acid than from alkaline culture solutions. There was no appreciable difference in the rate of PO_4 absorption from culture solutions having a reaction of pH 4, 5, and 6."

Potash shale as a source of potassium for growing plants, H. C. Heath (*Bot. Gaz., 90 (1930), No. 2, pp. 121–150, figs. 9*).—On the basis of the green and dry weights of plants of 12 species, grown in quartz sand and in four potassium-deficient soils, it was the conclusion of the author of this contribution from the Hull Botanical Laboratory that plants growing in potassium-deficient soils, especially peat soils, derive considerable benefit from the use as fertilizer of untreated potash shale. Further, a shale roasted at a red heat for 30 minutes produced responses even more marked than those from the untreated shale and contained 45 per cent more of water-soluble potassium than did the untreated mineral; and when the shale was roasted with 20 per cent of calcium carbonate the shale gave a response still a little better than that from the shale roasted alone and contained 12 per cent more of water-soluble potassium than did shale roasted alone. Roasting the shale with 37 per cent of gypsum increased the water-soluble potassium content 30 per cent more than did roasting it alone.

Other observations recorded include the fact that "the plants with more nearly neutral sap received about double the benefit from the shale that was received by plants with more acid sap, . . . [and that] residual effects obtained by growing two or three crops in the same pots of soil without additional fertilizer indicated that, after the most readily available potassium was taken up, the remainder became available very slowly under greenhouse conditions."

It was concluded that "shale, roasted with limestone or gypsum, would probably prove a valuable fertilizer in applications of 2 tons or more per acre, especially on peaty soils and for certain crops like red clover."

Some more recent lime findings in field research work in North Carolina, C. B. Williams, H. B. Mann, and A. S. Cline (*North Carolina Sta. Agron. Inform. Circ. 55 (1930), pp. [1]+8*).—On a Norfolk sandy loam at the Upper Coastal Plain Substation, about pH 5.2, the station was in general not able to obtain an increased yield by liming alone. As a supplement to fertilizer mixtures the lime usually did not pay the cost of its application, and in many cases it actually reduced the yield of corn, cotton, and peanuts.

On a Norfolk fine sandy loam at the Coastal Plain Substation corn responded more to an increased nitrogen ration on unlimed than on limed plats, corn and soybeans yielded more on the limed than on the unlimed plats, but corn root rot was much more serious on the limed soils. Legumes on the limed soils showed manganese deficiency chlorosis.

At the Blackland Substation a test of a very acid muck soil showed that "the first and most important limiting factor in profitable crop production is additions of lime."

At the Piedmont Substation the use of a moderate amount of lime seemed necessary on the Cecil clay loam of pH 6 when corn, cotton, and wheat were grown in rotation with clover. Cotton following red clover was badly affected with rust, especially when much phosphoric acid was present, while the use of potash seemed to prevent rust.

On Durham sandy loam at the Tobacco Substation ground dolomitic limestone used in connection with a properly proportioned complete fertilizer increased both the yield and quality of tobacco.

Favorable results were obtained at the Mountain Substation with corn and soybeans, unfavorable with potatoes, and somewhat conflicting as to wheat.

Possibilities of sulphur as a soil amendment, G. S. Fraps (*Texas Sta. Bul. 414 (1930), pp. 56*).—Alfalfa, cabbage, cotton, onions, and turnips were found to take up from 13 to 39 lbs. of sulfur an acre, corn, rice, oats, and wheat from 3 to 7 lbs. an acre. On the basis of 4 years' figures sulfur was supplied by the rainfall at the annual rate of about 12 lbs. an acre at 5 points in the State, at the rate of about 8 lbs. an acre at 7 other points, and at one point only 4 lbs. Irrigation waters in west Texas supplied from 12 to 200 lbs. in an acre-foot of the water.

Analyses of soils from various sections of the State indicated a sulfur content usually lower than that either of nitrogen or of phosphate. Nitrogenous, phosphatic, and potassic fertilizers are considered likely to supply ample sulfur as long as present types of commercial fertilizer are used. The use of highly concentrated fertilizers of little or no sulfur content might in time leave the soil deficient in sulfur, but no evidence of a present need of sulfur as a fertilizer in Texas was recognized.

Pot experiments in which the sulfur supplemented a fertilizer otherwise complete indicated an increase in crop yields in certain cases. Oxidation of the sulfur in the soil was not shown to have any significant effect on the availability either of phosphate or of potassium. In contrast with the success of the Ohio (E. S. R., 46, p. 428) and other stations, the author was unable to demonstrate any solubilizing effect of sulfur upon rock phosphate.

Commercial fertilizers, H. R. Kraybill et al. (*Indiana Sta. Circ. 171 (1930), pp. 76, fig. 1*).—In addition to the usual tabular report of inspection analyses, the circular contains definitions of fertilizers and terms used in connection therewith and the ruling of the State chemist with respect to simplified labeling, by which guaranties are stated on the bases of whole number percentage, of nitrogen in place of ammonia, and of the order nitrogen, available phosphoric acid, and water-soluble potash.

Commercial fertilizers in 1929–30 and their uses, G. S. Fraps and S. E. Asbury (*Texas Sta. Bul. 415 (1930), pp. 50*).—The bulletin contains the usual report of the State Fertilizer Control and provides information on the use of fertilizers with various crops. Plant food was found to cost less a pound in the more concentrated fertilizers.

AGRICULTURAL BOTANY

Determining moisture in living plant tissues, A. N. Wilcox (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 342–345, figs. 2*).—"The purpose of this paper is to bring to the attention of horticulturists a method by which the free water content of living tissues can be determined electrically, and to present an adaptation whereby a number of determinations can be made upon several loci in rapid succession and repeated upon the same respective loci at intervals."

The method consists essentially in measuring the electrical conductivity of the tissue. The apparatus and its use are described. It is thought that this

method should be useful also in certain physiological investigations, especially in those which are useful in horticulture. The electrical method makes possible a study of the water content of minute loci. The percentage of free water can be determined instantly, it is claimed, without greatly disturbing the tissue. "Bound water can be determined indirectly in cases where the total water content can be demonstrated to remain practically constant. The adaptation described herein makes it possible furthermore to study the changes and fluctuations in free water content which occur over a period of time in the same locus and also to extend the determinations to a number of loci at the same time."

The germination of seeds, growth of plants, and development of chlorophyll as influenced by selective solar irradiation, C. Sheard, G. M. Higgins, and W. I. Foster (*Science, 71 (1930), No. 1837, pp. 291–293*).—As the result of studies on the correspondence between the wave lengths in solar radiation and effects on life processes and products, it is stated that the ultraviolet and infra-red portions of the solar spectrum stimulate germination and enhance growth and development, while the green, the region of maximal energy, inhibits germination and growth. Chlorophyll development is enhanced under the yellowish-green, green, and greenish-blue portions, while the least development of chlorophyll occurs under the ultra-violet and infra-red portions of the spectrum.

Prolonged effect on Digitalis purpurea of exposure under ultra-violet-transmitting glass, A. McCrea (*Science, 71 (1930), No. 1839, p. 346*).—In 1927 and again in 1928 seedlings of foxglove (*D. purpurea*) were grown for about three months under an ultra-violet-transmitting glass, with controls under ordinary glass eliminating differences as regards temperature, moisture, and other factors. Both series were then grown in adjacent beds under open field conditions, and in each year, as previously noted (E. S. R., 61, p. 628), the treated plants proved superior in content of the active principles. The present report, regarded as final, deals with the history and outcome of the 1928 plants during the second season of this biennial species.

Numerous tests have shown that greater activity occurs during the first year. It is now regarded as proved also that the treated plants are the more potent. The control group showed 165 per cent as compared with the standard, the treated group 250 per cent, a net increase of potency of 51.5 per cent. It is, therefore, regarded as clearly established that *D. purpurea* is benefited permanently by exposure during seedling development under glass that admits an increased amount of ultra-violet radiation.

The influence of light, temperature, and other conditions on the ability of Nitella cells to concentrate halogens in the cell sap, D. R. Hoagland, P. L. Hibbard, and A. R. Davis (*Jour. Gen. Physiol., 10 (1926), No. 1, pp. 121–146, figs. 2*).—In connection with a general investigation of the absorption and utilization of mineral elements by plants, observations on the cells of *Nitella clavata* were previously reported (E. S. R., 51, p. 731), the primary object being to gain additional insight into the fundamental processes of absorption in relation to the nutrition of higher plants. The application of the method has been discussed (E. S. R., 55, p. 111). It is stated that the accuracy of the results secured by a special analytical technic has made it possible to study the accumulation of halogens in the cell sap of Nitella.

From a dilute solution, bromine may be accumulated in the sap in concentration much greater than that of the external solution, and the conductivity of the sap may be markedly increased by such accumulation. The process is slow. Chlorine may be lost from a cell as the result of an accumulation of bromine and vice versa. Other reciprocal relations between chlorine and

bromine are indicated. At equilibrium practically as much bromine accumulated in the sap with an external solution containing 1 milli-equivalent of bromine as with one containing 5 milli-equivalents. Light energy was indispensable to the accumulation of bromine, the temperature coefficient being characteristic of a chemical process.

The effect of colloidal silica on the absorption of phosphoric acid by plants, W. Thomas (*Science, 71 (1930), No. 1842, pp. 422, 423*).—In relation with a communication previously noted (E. S. R., 61, p. 504), a review is given of recent data and deductions as set forth by 21 authors or groups as indicated.

GENETICS

Chromosome counts in Vitis and related genera, K. Sax (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 32, 33*).—As determined from sections of the root tip or from pollen mother cells, the somatic chromosome number in *vinifera*, in *labrusca-vinifera* hybrids such as Niagara, and in several species was found to be 38, while a variety of the muscadine grape, *V. rotundifolia*, and the closely related genera Ampelopsis and Parthenocissus showed 40 somatic chromosomes. In several species both male and female plants were examined, with no difference in chromosome number associated with sex.

The chromosomes in man: Sex and somatic, H. M. Evans and O. Swezy (*Calif. Univ. Mem., 9 (1929), No. 1, pp. [5]+64, pls. 11, figs. 8*).—Studies have been made of the chromosome numbers observed in man based on counts made in 115 male embryonic sex cells, 17 male embryonic somatic cells, 29 female embryonic somatic cells, 12 adult female somatic cells, and 20 adult male somatic cells, from which it is concluded that the diploid chromosome number in both sexes is 48. In the male two of these have no synaptic mates of the same size and shape, and they represent the X and Y chromosomes. These separate at the first maturation division when reduction takes place in the formation of the germ cells. Measurements of the length of the chromosomes indicated that the longest pair in the male is slightly longer than the longest pair in the female in embryonic and adult tissues. A somewhat similar result was observed in the chromosomes of the rat.

Translocations involving the third and the fourth chromosomes of Drosophila melanogaster, T. Dobzhansky (*Genetics, 15 (1930), No. 4, pp. 347–399, pls. 2, figs. 4*).—Five cases of translocation in *D. melanogaster* due to treatment by X-rays were observed in which a section of the third chromosome became broken off and attached to the fourth chromosome. The loci at the breakage of the third chromosome was not constant. Crossing over was markedly decreased in the limb of the third chromosome in which the breakage occurred, and slightly increased in the opposite limb. Nondisjunction of the sections of the third and fourth chromosomes occurred in the translocations. Cytological studies confirmed the genetical findings.

The frequency of translocations produced by X-rays in Drosophila, H. J. Muller and E. Altenburg (*Genetics, 15 (1930), No. 4, pp. 283–311, fig. 1*).—The authors describe a method for detecting the occurrence of translocations in Drosophila which is based on the principle that the effect of genetic disproportion will often be sufficient to cause the inviability or abnormal appearance of one or both recombination classes of zygotes. A relatively high rate of occurrence of translocations following heavy X-ray irradiation was observed. In 883 fertile cultures derived from irradiated males there were observed 117 translocations involving breakage of one of the autosomes and the subsequent attachment of a fragment to a nonhomologous chromosome. It was apparent

from the results that fragments from either of the long chromosomes might be attached to any of the other chromosomes, but there was a greater tendency for attachment to be made to one of the long chromosomes. A large proportion of the induced translocations was found to produce lethal effects or result in sterility when homozygous.

Genetic studies in barley, D. W. ROBERTSON and G. W. DEMING (*Jour. Heredity, 21 (1930), No. 6, pp. 283–288, figs. 3*).—The chlorophyll deficient seedling types chlorina ($F_c f_c$) in Colsess barley and yellow ($X_{c_2} x_{c_2}$), white ($A_{c_2} a_{c_2}$), and virescent ($Y_c y_c$), all in Coast barley, were found in Colorado Experiment Station studies to be recessive to normal green and each to be dependent on a single factor difference. The factor pair $A_c a_c$ for green v. white and $X_c x_c$ for green v. xantha seedlings studied previously (E. S. R., 60, p. 726) were inherited independently of $F_c f_c$, $X_{c_2} x_{c_2}$, $A_{c_2} a_{c_2}$, and $Y_c y_c$. In inheritance the pair $F_c f_c$ was also independent of $A_T a_T$ for green v. white seedlings in Trebi and of $X_{c_2} x_{c_2}$ and $A_{c_2} a_{c_2}$. Likewise, *Kk* for hoods v. awns was inherited independently of $X_{c_2} x_{c_2}$, $Y_c y_c$, and $F_c f_c$. A 3-factor difference was found between the smooth style of Lion and the feathered style of Coast barley, the factor pairs being designated *G g*, *G′ g′*, and *G″ g″*, respectively.

Heritable characters of maize.—XXXV, Male sterile, W. R. SINGLETON and D. F. JONES (*Jour. Heredity, 21 (1930), No. 6, pp. 266–268, fig. 1*).—The thirty-fifth article of this series (E. S. R., 63, p. 124) describes a factor causing the tassel to be sterile and termed "male sterile," ms_1. Simple Mendelian inheritance of the factor was indicated in tests at the Connecticut State Experiment Station. The plants are very similar to those described by Eyster (E. S. R., 47, p. 326). Male sterile plants produce normal ears, and plants heterozygous for ms_1 are normal for pollen production as well. The possible use of ms_1 in the production of crossed seed corn is pointed out.

The interrelations of some anthocyan-factors in the potato, M. J. SIRKS (*Genetica [The Hague], 11 (1929), No. 3–4, pp. 293–328*).—The development of anthocyanin in the seedlings, leaf axils, young and old internodes, skins, eyes, and sprouts was studied in a number of selfed potato varieties and in twelve hybrids. Observations in the cultures led to the assumption of a number of factors.

The factor *P*, which causes blue color in old internodes, is epistatic to *R*, which causes red anthocyanin, and the segregations of both are monohybrid in character. The color of young internodes seemed to depend on the presence of one or both *P* and *R*, together with *D*. Similarly the color of eyes depends on the presence of *P* or *R* together with the factor *S*. Blue-skinned tubers are of the constitution *DPRS* or *DPrS* and red-tubered plants *DpRS*. In the homozygous state *B* causes a blue color in seedlings, axils, and sprouts, and *C*, similarly, a red color, whereas in the heterozygous state *B* and *C* cause, respectively, only the blue and red colors of the axils. The factors *B*, *C*, and their common recessive *b* form a series of triple allelomorphs. The combinations of *D* and *P* cause a blue color and of *D* and *R* a red color in seedlings, axils, and sprouts. The colors produced by these factors are epistatic to those due to *B* or *C*.

Inheritance in lettuce, C. E. DURST (*Illinois Sta. Bul. 356 (1930), pp. 237–341, figs. 3*).—This is a second and more complete report (E. S. R., 61, p. 429) upon breeding studies involving wild and cultivated forms of lettuce.

Self-fertility was found to predominate in lettuce.

Crosses between pigmented and nonpigmented plants showed that anthocyanin coloration is dominant and apparently in most cases controlled by simple Mendelian factors. Crosses between black- and white-seeded lettuces showed

black to be dominant and generally on the basis of a single pair of genes. Prickly condition of the midribs of leaves was found dominant over smoothness and was apparently inherited in simple Mendelian form. In respect to lobing of leaves, lobing was dominant but apparently controlled by two pairs of genes. Other morphological characters were analyzed in respect to their manner of inheritance. In most cases the genes of the wild lettuce were dominant to those of the cultivated forms with respect to quantitative factors. In crosses between the wild and cultivated lettuces the F_1 was no more variable as a rule than the parental types, with increased variability and segregation in the F_2 and some segregation in the F_3 and F_4 generations. It is considered likely that cultivated lettuces developed from *Lactuca scariola*, any differences being explainable on the basis of gene mutations. Cultivated varieties are considered the result of genetic combinations favored by moist weather conditions. Modified and deviating Mendelian ratios obtained are thought to result from linkage of qualitative genes with genes that influence fertility or sterility and that are responsive to changes in environment.

Pear breeding: An inheritance study of Pyrus communis × P. ussuriensis hybrid fruits, H. L. Lantz (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 13–19*).—Analyses by the Iowa Experiment Station of the progenies of crosses between several *P. ussuriensis* hybrids and certain well-known varieties of *P. communis* showed certain characteristic differences that could be associated with the *P. communis* parent. Although low quality was dominant throughout all the seedlings, the Bartlett progeny was slightly superior to the others in that it contained the highest percentage of good and fair quality fruits. Season of maturity was apparently influenced, the Bartlett progeny averaging earlier than those of Sheldon, Flemish, or Howell parentage. Sheldon yielded the largest proportion of October ripening fruits. The progenies of Flemish and Howell were quite similar in average size, flesh characters, quality, and season, the widest difference being between Bartlett and Sheldon progenies. Oblate shape was recessive to pyriform.

The genetics of the horse, F. A. E. Crew and A. D. B. Smith (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1930, vol. 6, pp. 123–170, figs. 5*).—After a review of the literature on the inheritance of various characteristics in the horse, the authors consider that the following factors are established: *B* black, *I* partial inhibition of black causing bay or brown, *H* diluting chestnut to sorrel, *G* gray, *Gr* dilutes gray to light gray, *R* roan, *S* sprinkling of white hair through the coat, *D* dun, *WW* white, which in the heterozygous form is incompletely dominant to other characters, *aa* albino, *M* white markings, which are influenced by modifying factors, *P* piebald. *H* dark spots on cheek, *T* irregular white markings on croup, *cc* chubary, *ZZ* zebra markings, *blbl* thin arteries resulting in bleeding, *atat* atresia coli, *O* osteoporosis or big head, *roro* diathesis to roaring, *Q* long gestation period, *vv* five lumbar vertebrae.

The characteristics of the mule and zebra horse hybrids are also very briefly discussed. An extensive bibliography is included.

Studies on inheritance in pigeons.—VII, Inheritance of red and black color patterns in pigeons, W. R. Hollander (*Genetics, 15 (1930), No. 4, pp. 312–346, figs. 4*).—In continuing this series (E. S. R., 57, p. 624) the author has studied the inheritance of a color pattern designated as kitiness, in which there is an intimate mixture of red and black over the entire bird, and the pattern found in Archangel pigeons in which the red and black are confined to definite areas. These factors were both dependent for their expression upon the presence of the extension factor for black pigment (*E*). The gene for kitiness was dominant, though recessive red pigment might carry it without

expression. The dilution gene (*i*) produced an intimate mixture of yellow and dun instead of red and black. The clumping gene (*s*) caused birds, which would otherwise show an intimate mixture of red and black, to develop a mixture of red and blue. The Archangel pattern is recessive to self black and appears to be controlled by the presence of two genes (*P* and *Q*); *pp* produces the Archangel pattern, but *Q* prevents its production on the head and neck in the juvenile plumage. The pattern resulting from the gene *A* is epistatic to the Archangel and the kitey patterns. The crest on the head of an Archangel pigeon is inherited as a simple Mendelian recessive.

The characteristics of the progeny of different types of matings are tabulated and discussed.

Parthenogenetic development of eggs in the ovary of the guinea pig, L. LOEB (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 5, pp. 413–416*).—Additional evidence is cited to indicate the parthenogenetic development of the eggs in the ovary of the guinea pigs. In two animals early embryos corresponding to the neurula were observed within the ovaries, and in more than 30 guinea pigs structures closely corresponding to the fetal placenta were found in the ovaries. The author concludes that there is not the slightest similarity between these structures and normal or abnormal corpora lutea.

Effect of lutein feeding on the oestrus of the guinea pig, D. I. MACHT and A. E. STICKELS (*Soc. Expt. Biol. and Med. Proc., 27 (1930) No. 5, pp. 427–430*).—In several experiments it was found that the feeding of corpus luteum substance was followed by a definite inhibition of the oestrum and a prolongation of the dioestrus period. The first effects from the feeding, however, were noted for a 4-week period, and more marked effects were noted after administering the corpus luteum substance for 6 and 8 weeks. From this and other experiments in which preparations of the follicular hormone were fed, it was concluded that feeding corpus luteum extracts and other ovarian hormones is followed by definite physiological effects, as indicated by a study of the vaginal smears.

Production of a premenstrual endometrium in castrated monkeys by ovarian hormones, F. L. HISAW, R. K. MEYER, and H. L. FEVOLD (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 5, pp. 400–403, figs. 2*).—Data are presented to show the possibility of producing premenstrual changes in the uterus of castrated monkeys through the combined administration of follicular and corpus luteum hormones. Five monkeys were employed in these tests. Two received 340 and 305 rat units of follicular hormone supplemented with the equivalent of 1,040 and 1,690 gms., respectively, of fresh corpus luteum tissue. The premenstrual changes induced in the uteri of these two monkeys were more pronounced than the changes induced in the other three monkeys which received corpus luteum equivalents of 360 to 450 gms.

Sex linkage in man, C. B. DAVENPORT (*Genetics, 15 (1930), No. 5, pp. 401–444, figs. 8*).—The occurrence of sex-linked characters in man is briefly discussed, from which it is concluded that the different traits behave differently in inheritance. Color-blindness is typical of sex-linked character, but females homozygous for hemophilia die. Several genetic types of optic nerve atrophy were observed, but only one was typically sex-linked. The incidence of this condition in the females was relatively high, probably due to the expression of the trait in the heterozygous condition. Other sex-linked characters discussed are hypoplasia of brain substance, night blindness, myopia, pseudohypertrophic muscular paralysis, megalocornia, wanderlust, coloboma, nystagmus, microphthalmia, ichthyosis, webbed toes, toothlessness, and deficiency in sense of smell. Attention was given to the linkages between the sex-linked

characters where more than one was observed in a single family, and a case of crossing over between night blindness and myopia was noted.

The correlation between the sex of human siblings.—I, The correlation in the general population, J. A. Harris and B. Gunstad (*Genetics, 15 (1930), No. 5, pp. 445–461*).—A study of the distribution of the sexes in large series of German families of various sizes showed that the distribution was not strictly in accord with the theory that sex is determined wholly by chance. A large portion of the paper is devoted to a consideration of expressing the expected distribution and deviations therefrom. It is pointed out that the data employed are deficient in that no account is taken of the sex of those dying prematurely.

FIELD CROPS

Winter cover crop experiments at the Pee Dee Experiment Station, E. E. Hall, W. B. Albert, and S. J. Watson, jr. (*South Carolina Sta. Circ. 42 (1930), pp. 14, figs. 4*).—Grown in the winters of 1928–29 and 1929–30, the respective acre production of nitrogen in the top growth and of dry matter were for hairy vetch 92 lbs. and 2,783 lbs.; Monantha vetch 83, 2,860; Hungarian vetch 62, 2,332; and Austrian Winter field peas 53 lbs. and 1,953 lbs. The nitrogen productions were estimated to be equivalent to 556, 504, 377, and 319 lbs., respectively, of sodium nitrate. Austrian Winter field peas on limed and fertilized soil produced an acre average of 142 lbs. of nitrogen in the top growth. Due to winterkilling, Canada field peas were unsuitable for a cover crop. Early fall seeding, preferably September, is advised for best results. See also an account of similar studies at Clemson College (E. S. R., 62, p. 33).

Field and vegetable crops of Armenia [trans. title], E. A. Stoletova (*Trudy Prikl. Bot., Genet. i Selek.* (*Bul. Appl. Bot., Genet. and Plant-Breeding*), *23 (1930), No. 4, pp. 376, figs. 98; Eng. abs., pp. 331–366*).—The environmental and agricultural conditions in Armenia and the varieties and distribution of the cereal root, fiber, oilseed, legume, forage, and vegetable crops are described from an extensive survey in 1925 and 1926.

Root reserves of alfalfa with special reference to time of cutting and yield, C. J. Willard (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 595–602*).—Additional information is presented by the Ohio Experiment Station on the effects of cutting alfalfa a number of times per year at Columbus, Ohio. Data on hay production have been recorded earlier (E. S. R., 61, p. 436).

The extensive reduction of alfalfa root reserves as measured by total weight of roots per acre consistently resulted in a reduction in yield and vigor of growth. While severe winterkilling from heaving followed extreme reduction in reserves, the loss in vigor occurred without this. Young alfalfa gained in root reserves regularly and consistently up to the first cutting for hay, both in the fall of the seeding year and in late April, May, and early June of the next year. In four years alfalfa did not show a gain in root reserves in August when the second cutting was allowed to stand from the full bloom to the seed stage. In June during the same period gains took place in some years and not in others. Such failure to store root reserves after full bloom was associated with yellowed and diseased leaves, and evidently was not indicative that gains during this stage would not occur in a region where the leaves remained healthy. The loss in root reserves in recovery after cutting averaged 177 lbs. per acre, which was accompanied by an average loss of 0.17 per cent of nitrogen (on an air-dry basis). The recovery after cutting was accompanied almost uniformly by a decrease in the percentage of dry matter in the green roots, averaging 4.9 per cent.

The most uniformly important period of root storage at Columbus is in October, when the last cutting of the season has been taken off early enough so that considerable top growth has been produced by October 1. The most favorable condition for storage of root reserves seemed to be the combination of a large amount of healthy leaf area and drier weather than normal. Although Grimm and other variegated varieties of alfalfa are more winter hardy than common alfalfas under all cutting treatments, there was no evidence that this difference is due to or associated with differences in the amount of root reserves stored. The effect of cutting on different dates at Columbus was determined nearly as much by the activities of the potato leafhopper as by root reserves.

Seed setting in alfalfa, A. E. Clarke and J. R. Fryer (*Sci. Agr., 11 (1930), No. 1, pp. 38–43, fig. 1*).—The relation of tripping to seed production in alfalfa was studied at the University of Alberta in the summers of 1926, 1927, and 1929. The untripped flowers inclosed in bags were found to set seed less freely than flowers left uncovered. Artificial tripping was found to increase considerably the extent of seed setting and hence the seed yields. Many plants were found to produce high percentages of sterile (empty) pollen grains. Although the percentage varied among plants, it remained constant for particular plants even when the pollen was produced under different conditions. The variable production of sterile pollen among plants is emphasized as a matter of important consideration for the plant breeder. Literature dealing with the problem is reviewed briefly.

Influence of bagging on oil percentage in castor, G. B. Patvardhan (*Poona Agr. Col. Mag., 22 (1930), No. 1, p. 13*).—Bagging inflorescences of castor-bean to obtain selfed seed did not affect the oil content appreciably.

Correlation of oil content to presence of color in the stem of castor (Ricinus communis), G. B. Patvardhan (*Poona Agr. Col. Mag., 22 (1930), No. 1, pp. 16–18*).—Oil contents of seed from red-stemmed castor-bean plants ranged from 40.45 to 54.97 per cent and 32 samples averaged 45.94 per cent, and from green-stemmed plants ranged from 35.75 to 54.24 and averaged 51.21 per cent.

Fractional neutralization of soil acidity for the establishment of clover, W. A. Albrecht and E. M. Poirot (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 649–657, figs. 2*).—Field experiments at the Missouri Experiment Station demonstrated that quantities of lime as small as 300 lbs. of 30-mesh material per acre, combined with inoculated soil and drilled with the clover seed, were as effective as 5,000 lbs. of 10-mesh limestone broadcast for establishing the clover crop on lime-deficient Gerald silt loam. The use of small amounts of fine lime drilled with the seed was effective in establishing both red clover and sweetclover. Crops of sweetclover produced with fine lime were as good as those produced by the heavy applications of the 10-mesh stone, and the crops of red clover were usually superior with the 30-mesh stone treatments. The finer lime seemed to hasten the development of thorough inoculation on the roots of the clovers and to help establish them more quickly. The results suggested that it may be necessary to provide only certain limited areas of limed soil accessible to the clover roots.

Indian corn, J. B. McNair (*Field Mus. Nat. Hist. [Chicago], Dept. Bot. Leaflet 14 (1930), pp. 33, pl. 1, figs. 4*).—A popular discussion of the origin, geographic distribution, and varieties of corn, its use by the American Indian, and modern industrial and experimental products.

Corn for the Northwest, G. F. Will (*St. Paul, Minn.: Webb Book Pub. Co., 1930, pp. 158, figs. 52*).—This practical manual is concerned with the history

and status of corn culture in northwestern United States, cultural and harvesting practices, varieties and improvement, and utilization of the crop.

Importance of certain factors, particularly the disease, in the selection and breeding of corn, including some historical facts, D. W. BAGLEY (*North Carolina Sta. Agron. Inform. Circ. 56 (1930), pp. [1]+4*).—A popular account of factors involved in corn improvement.

Plant characters as indices in relation to the ability of corn strains to withstand lodging, H. K. WILSON (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 453–458, fig. 1*).—Preliminary greenhouse and field studies at the Minnesota Experiment Station involving selfed strains of Rustler, Minnesota No. 13, and Northwestern Dent gave indications that the distance between the lower internodes of the corn plant and the accompanying development of brace roots may be useful in predicting the probable resistance of selfed lines to lodging under field conditions. It was suggested that growing corn plants in the greenhouse with insufficient light, as under winter conditions, may produce lodging in a manner similar to field performance.

Use of commercial fertilizers in the growing of cotton, J. J. SKINNER (*North Carolina Sta. Agron. Inform. Circ. 53 (1930), pp. [1]+9*).—A practical discussion of the functions and sources and responses to and methods of using the essential fertilizer ingredients on cotton.

Variation in lint length in cotton, V. RAMANATHA AYYAR and C. JAGANNATHA RAO (*Agr. Jour. India, 25 (1930), No. 1, pp. 42–52, figs. 2*).—Studies at the Cotton Breeding Station, Kovilpatti, Madras, on plants of Nandyal 14 (*Gossypium indicum*) and Coimbatore 1 (*G. hirsutum*) cotton showed that definite differences existed in the lint lengths of seeds produced in different pickings, although there was no definite relation between lint length and the date of picking, and lint length did not vary significantly between lock to lock in the same boll. The topmost seed in the lock had the shortest staple, and it appeared that there may be, in certain strains, differences in lint lengths of seeds according to their position in the lock. The lint on the right side of the seed was found longer than that on the left.

Quartering cottonseed samples, G. S. MELOY (*Cotton Oil Press, 14 (1930), No. 5, p. 21, figs. 2*).—A device for reducing or quartering a sample of cottonseed and maintaining its characteristics, developed in the U. S. Department of Agriculture by the author working with F. S. Hubbard, is described and illustrated.

Nitrate fertilizers for oats in Iowa, R. A. PENDLETON (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 663–668*).—Fertilizer experiments with oats on Shelby loam in the greenhouse and on Carrington loam in the field at the Iowa State College indicated that early applications of sodium nitrate may increase the yield of oats appreciably and more effectively than late applications. In both series an increase in the nitrogen content of the grain resulted from both the early and late applications, the later applications being the more effective. Superphosphate without sodium nitrate had little effect on the oats. Although sodium nitrate at the rate of 200 lbs. per acre, particularly when applied late, tended to produce a late growth of straw and delayed maturity, the field results indicated that this quantity might be used to advantage if applied with superphosphate.

Preliminary report on three years' fertilizer experiments with early Irish potatoes on the farm of A. W. Baker, Aurora, Beaufort County, North Carolina, 1928–30, J. J. SKINNER, C. B. WILLIAMS, and H. B. MANN (*North Carolina Sta. Agron. Inform. Circ. 54 (1930), pp. [1]+4*).—Fertilizer tests with early potatoes on Bladen fine sandy loam in cooperation with the

U. S. Department of Agriculture generally showed best yields to come from the rate of 2,000 lbs. per acre, application of one-half the fertilizer before planting and one-half after the potatoes were up, a 6–7–5 (P–N–K) formula, 6 per cent of potash in the mixture, potassium chloride of the potassium carriers, and from 6 to 8 per cent of ammonia in a 6–0–5 mixture. Comparisons of nitrogen carriers are also noted.

A study in sampling technique: The effect of artificial fertilisers on the yield of potatoes, J. Wishart and A. R. Clapham (*Jour. Agr. Sci. [England], 19 (1929), No. 4, pp. 600–618, fig. 1*).—Analysis of the yields of 54 sub-plats of the Rothamsted potato experiment of 1928, both as estimated by a sampling method and as determined by large scale digging, showed that most of the significant results of the experiment could be obtained from the sample yields, although the higher standard error per plat obscured the effect of one of the fertilizers, superphosphate. The experiment was of the "randomized blocks" pattern devised by Fisher (E. S. R., 58, p. 632). It was concluded that 102 plants would have to be dug at Rothamsted and 56 at Woburn to give a sampling error as small as 4 per cent. It would, then, be profitable to sample only experimental plats $\frac{1}{40}$ acre or more in area.

Reed canary grass for meadows and pastures, A. C. Arny, R. E. Hodgson, and G. H. Nesom (*Minnesota Sta. Bul. 263 (1930), pp. 27, figs. 14*).—The history, adaptation, plant and seed characteristics, cultural requirements, uses, composition (E. S. R., 62, p. 831), feeding value, seed production and harvest, and improvement of canary grass are reviewed in a revision and enlargement of Bulletin 252 (E. S. R., 61, p. 331).

Sap extraction of sorghum and the localization of juice and sugars in internodes of the plant, G. Janssen, C. K. McClelland, and W. H. Metzger (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 627–639, figs. 5*).—The principal observations in experiments at the Arkansas Experiment Station with sorgo for sirup manufacture, described here in detail, have been noted from another source (E. S. R., 62, p. 829).

Experiments in the cultivation of the sugar beet crop in the west midlands during 1928: A statistical examination of the effect of spacing, W. M. Davies and F. J. Dudley (*Jour. Agr. Sci. [England], 19 (1929), No. 4, pp. 619–626, fig. 1*).—In further experiments (E. S. R., 60, p. 536) sugar beets were spaced 4, 6, 8, and 10 in. apart in rows 15, 18, 21, and 24 in. apart and the plats were grown in quadruplicate.

Varying the width between the rows affected the yields of roots, the expectation of highest yield being on the narrowest spacings. A significant increase in yield was to be gained by using 15 or 18 in. spacing instead of 21 or 24 in., whereas the yield of tops and crowns did not seem to be affected. The distance between plants in the rows up to 10 in. had no significant effect on the yield of roots, although a reduction in yield took place in wider spacings. There were no significant differences in yield per acre due to variations in area per plant, nor was a relation between fanging and spacing noticeable. The dirt tare varied considerably, whereas the sugar content was rather more uniform. Its maximum variation was from 16.72 to 18.19 per cent, and its average was 17.38 per cent for the whole area. The disposition of bolters was entirely random; they amounted to 0.4 per cent of the crop.

Tobacco fertilizer recommendations, C. B. Williams et al. (*Amer. Fert., 73 (1930), No. 6, pp. 23, 24*).—Analyses, rates, and nutrient sources are indicated currently for fertilizers for bright flue-cured and dark (sun-cured and shipping) tobacco and for plant beds on average soils in Virginia, North Carolina, South Carolina, and Georgia.

In which way does manuring affect the odor and flavor of the cigar tobacco in the Vorstenlanden? [trans. title], C. COOLHAAS (*Proefsta. Vorstenland. Tabak [Dutch East Indies], Meded. 66 [1929], pp. [2]+22; Eng. abs., pp. 21, 22*).—Examinations in the Netherlands of tobacco variously fertilized in Java showed that the odor and flavor of unfertilized tobacco were much inferior to those of the fertilized crop. Applications of ammonium sulfate favored these qualities, especially when supplemented with double superphosphate. Both of these materials were preferable to farmyard manure.

Variation in the quality of wheat grown in replicate plots, R. NEWTON and J. G. MALLOCH (*Sci. Agr., 10 (1930), No. 10, pp. 669–677*).—The protein content of 12 varieties of wheat grown in 1927 in quadruplicate plats on an apparently uniform experimental block at Raymond, Alta., showed a spread between replicates ranging from 2.2 to 4.9 per cent in individual varieties. The coefficient of variation in protein content of varieties ranged from 8.2 to 15.1 and in percentage of vitreous kernels from 12.8 to 160.7. Differences due to soil heterogeneity were greater than those due to variety. The spread in protein content of 13 varieties grown in 1928 at the University of Alberta at Edmonton ranged only from 0.3 to 1.6 per cent and its coefficient of variation from 1 to 5.8. These variations, although comparatively small, exceeded those due to the combined effect of errors in sampling and in determining protein content. A series of wheats grown at Lethbridge, Alta., in 1926 and 1927 also showed the unreliability of quality tests based on samples from single plats. It was evident that wide variations may occur in the quality of wheat grown in replicate plats, and that variations in yield and quality are not necessarily related.

Evaluating the quality of wheat varieties by co-operative tests, C. O. SWANSON (*Cereal Chem., 7 (1930), No. 1, pp. 66–78*).—Milling and baking tests on 5 wheat varieties grown in several localities in Kansas were made by 17 cereal chemists cooperating with the Kansas Experiment Station. According to a summary of the ranking of the varieties Tenmarq, a new hybrid wheat, easily led; Blackhull, Turkey, and Kanred vied for second and third places; and Superhard ranked lowest.

The Hopkinsville experiment field, G. ROBERTS, J. F. FREEMAN, and E. J. KINNEY (*Kentucky Sta. Bul. 299 (1930), pp. 30, fig. 1*).—The causes of low wheat yields in Christian County, Ky., and means of increasing them were studied near Hopkinsville on badly-worn Hagerstown silt loam soil from 1922 to 1929, inclusive. Wheat, corn, tobacco, clover, and soybeans were variously fertilized in 2-, 3-, and 4-year rotations, and wheat and corn varieties were grown in comparative tests.

The results obtained, considered together with current trends in agriculture, suggest that a rotation of corn, wheat, clover, and wheat, with sweetclover sown on the last wheat crop to be turned under for corn the next spring would be good when wheat is desired as a major crop. This would give a clover sod to be broken for one crop of wheat, and the manure produced could be used on the wheat following corn. Following soybeans in a rotation, wheat yields are relatively high. Indications are that in the future wheat probably will be restricted to the larger and more fertile farms of Kentucky as a transfer crop between cultivated crops and grass and clover.

Plenty of organic matter and nitrogen appeared essential for economical production of large wheat yields, a legume crop being considered a means of increasing the nitrogen supply. Liming is also necessary, and until the soil is restored to fair productiveness 200 lbs. of 16 per cent superphosphate or its equivalent in other phosphorus carriers can be used annually. Enough for the rotation may be used in one application when the wheat is sown, or only enough

fertilizer for the wheat and clover may be used when the wheat is sown and the remainder used on the other crops of the rotation. In some cases it may be profitable to use potash and nitrogen also for the wheat crop.

Red Rock led the wheat varieties during four years, although Ashland, Trumbull, two strains of Currell, and Fulcaster gave similar results. Pride of Saline, Reid Yellow Dent, and Iowa Silver Mine were the most satisfactory of the corn varieties tested for several years.

Indications that available nitrogen may be a limiting factor in hard winter wheat production, P. L. GAINEY and M. C. SEWELL (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 639–641*).—Samples of growing grain and soil were collected from typical small, well-defined areas, usually from 2 to 4 ft. in diameter, with taller and darker green plants and from the immediately adjacent surrounding area in 38 wheat fields in 20 counties of central and western Kansas. Determinations at the Kansas Experiment Station showed that plants from the spots had made 2.6 times the total growth, contained 1.8 times as much nitrogen per unit weight, and had actually assimilated 4.68 times as much nitrogen per plant as those from the field at large. Notwithstanding this assimilation by the plants, the soil of the spots contained 2.5 times as much NO_3 and was capable of increasing this surplus to 3.3 times as much in 6 weeks.

The data were tentatively interpreted as indicating that the increased growth and yield of grain on the type of spots studied can be attributed primarily to a more abundant supply of available nitrogen, and that the soil can supply more available nitrogen to the growing plant because a limited quantity of nitrogen capable of being more easily transformed into the nitrate form has found its way into the soil.

Relation between protein content and quality of wheat as shown by different baking methods, R. K. LARMOUR (*Cereal Chem., 7 (1930), No. 1, pp. 35–48, figs. 2*).—Flours milled at the University of Saskatchewan from 286 samples of pure varieties of wheat, mostly Marquis, grown in Saskatchewan in 1926, 1927, and 1928, were baked by a simple formula of flour, water, salt, yeast, and sugar, and also by a formula including potassium bromate. In the author's opinion the latter method appeared to give a more accurate measure of quality. Correlation coefficients for protein of wheat and quality, as measured by the bromate method, were in practically all cases high enough to warrant the conclusion that the relation between these two characters of sound wheat is significant enough to justify the commercial use of the protein test as a factor in the classification of hard red spring wheat.

Seed production and seed trade in Hungary (*IV. International Congress of the Seed Trade. Budapest: Hungarian Seed Merchants Assoc., 1930, pp. 48, figs. 19*).—Articles on the production and control of crop seeds in Hungary include Cultivation of Fodder Plants in Hungary (pp. 3–9) and Cultivation of Oleiferous Plants in Hungary (pp. 19–22), both by E. Villax; Hungarian Alfalfa, by A. de Degen (pp. 10–18); The Present Position of Plant-Breeding in Hungary, with Special Reference to the Breeding of Fodder Plants and to the Regulation by Law of the Trade in Improved Seeds, by E. Grabner (pp. 23–31); Seed Control in Hungary, by G. Lengyel (pp. 32–40); and The Hungarian Seed Trade—Ten Years of its History, by A. Varannai (pp. 41–48).

The weed seed population of arable soil.—I, Numerical estimation of viable seeds and observations on their natural dormancy, W. E. BRENCHLEY and K. WARINGTON (*Jour. Ecology, 18 (1930), No. 2, pp. 235–272, pl. 1, figs. 12*).—The number of viable weed seeds, as indicated by the seedlings germinating, was estimated in soil samples taken for several years in succession, both before

and during specified schemes of fallowing, from the permanent wheat and barley fields at the Rothamsted and Woburn Experimental Stations.

The actual number of living seeds per acre of some species was very large, poppies reaching an average of 113 millions per acre and being still more plentiful in certain plats. Comparatively few species were found to germinate freely throughout the year; most species showed a definite periodicity, the majority of seedlings appearing during autumn or winter, or both, and relatively few in late spring and summer. Many weed seeds in the soil seemed to have a period of natural dormancy, varying with the species, during which they would not start to grow even when placed under conditions favorable for germination. Seeds buried in soil under conditions unsuitable for germination may retain vitality for many years, such prolonged dormancy being termed "induced" in contrast to the natural dormancy.

A definite association appeared to exist between the weed flora and the type of long-continued fertilization. This association evidently is influenced by the nature of the soil and to a lesser extent by the repeated growth of an autumn or spring-sown cereal, and is reflected in the total number of viable weed seeds of all species per unit area, the preference of some species for certain fertilizers, and the effect of liming on the prevalence of species occurring with certain fertilizer combinations. Certain weeds, as *Alchemilla* spp. and *Veronica* spp., showed a marked preference for either the wheat or barley crop in both types of soil examined, an association apparently caused by the method of cultivation rather than by any direct influence of the crop itself on the weeds. Although a certain association exists between some weeds and the soil in which they grow, the prevalence of poppy, a typical light-land weed, on the heavy soil at Rothamsted showed that corroborative evidence from a large area is necessary before such an association can be regarded as established.

Weeds and weed seeds illustrated and described (*Canada Dept. Agr. Bul. 137, n. ser. (1930), pp. 72, figs. 187*).—A revision of the publication noted earlier (E. S. R., 46, p. 443).

A weed survey of Iowa, L. H. PAMMEL and C. M. KING (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 587–594*).—Weed species observed in the course of a survey in several counties by the Iowa State College are tabulated and discussed for meadows, pastures, roadsides, and fields of different crops.

Lead arsenate experiments on the germination of weed seeds, W. C. MUENSCHER (*New York Cornell Sta. Bul. 508 (1930), pp. 10*).—Lead arsenate applied to the upper soil layers at rates of from 10 to 100 lbs. per 1,000 sq. ft. did not prevent the germination of weed seeds or the growth of seedlings of a number of common lawn weeds. The use of lead arsenate with top-dressings on lawns did not appear practicable as a general method for the control of weeds.

The psysiology of Convolvulus arvensis (morning-glory or bindweed) in relation to its control by chemical sprays, A. S. CRAFTS and P. B. KENNEDY (*Plant Physiol., 5 (1930), No. 3, pp. 329–344, figs. 5*).—Further weed control experiments at the University of California (E. S. R., 59, p. 632) were concerned with the factors controlling penetration and subsequent distribution of chemicals throughout the living tissues of wild morning-glory.

Acid solutions of arsenicals were found more effective than basic ones in penetrating cortical tissues in the morning-glory. Solutions between pH 3 and pH 9 did not appear to cause rapid injury to tissues, the direct effect of their pH value being negligible. Plant buffers were found to be active in neutralizing acid and alkaline sprays. Arsenic trioxide was soluble to a concentration of about one-twentieth molal at the pH of plant sap.

Arsenic moved freely through the xylem of morning-glory plants. While cut shoots took up enough one-twentieth molal arsenic trioxide solution in 1 hour to be completely killed, injury was apparent only after a lapse of about 20 hours. Eosin entered cut stems and moved toward the roots at a rate as high as 2.46 in. per second for 5 seconds, although the rate decreased as the water deficit became satisfied. Water deficit, as indicated by the uptake of eosin solution, is correlated with soil moisture and transpiration. Prolonged exposure to the spray solution, as by the condensation of dew or addition of water to the leaves, seemed to increase greatly the depth of penetration of the arsenic. Maturity is considered an index of the proper time for spraying only as it is accompanied by water deficit; an examination of the pressure conditions in the xylem is held a much more accurate test.

Analyses showed that the lethal concentrations of arsenic were 0.02 per cent of the dry weight in tops and 0.0003 per cent in roots.

Effect of time of cutting on the elimination of bushes in pastures, B. A. Brown (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 603–605, figs. 3*).—Cut-over sprout land at the Connecticut Storrs Experiment Station carrying sprouts of maple, alder, and birch was mowed on different plats each month from April to September in 1925, 1926, 1927, and 1928, and the surviving bushes were allowed to grow in 1929. Plats mowed for 4 years in April and May were in September, 1929, still largely covered by brush over 30 in. high and by the smaller growing species, as fern, cinquefoil, and blueberries, and very few palatable plants. Mowing during the winter gave practically the same results. A plat cut in September had a somewhat thinner stand of bushes and weeds than those mowed in April and May. On the other hand, plats cut in June, July, or August presented a greatly improved condition for pasture. July seemed to be the best time to mow so far as subduing undesirable species is concerned, although mowing in August and June gave results nearly as good.

HORTICULTURE

The production of table beet seed under glassine bags, R. Magruder (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 20–25*).—As a result of one season's work in the greenhouse and two in the field the author concludes that there is considerable self-sterility in the table beet, but that it should be possible to isolate strains sufficiently self-fertile to perpetuate themselves. In the greenhouse in eight out of nine cases the use of mixed pollen from other plants resulted in larger percentages of stimulated carpels than did self-pollination. In the greenhouse tests the set of seed was increased by shaking the bags at noon or by hand pollination. The bags per se had little, if any, deleterious effect on fertilization and subsequent development of the embryo. Only a small percentage of the stimulated carpels contained viable embryos.

Observations on the type of sterility in Brassica oleracea var. capitata, O. H. Pearson (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 34–38*).—Working with Copenhagen Market cabbage plants inbred for four generations, it was found at the University of California that the application of pollen to the stigma while yet inclosed in the bud was much more effective in producing seed than was pollination at anthesis. The average number of seeds per pod for flowers pollinated at anthesis was 1.47, as compared with 11.8 for bud-pollinated blooms. Considerable variation was noted in the response of distinct strains, a result thought due to hereditary differences. The time elapsing between pollination and degeneration of the egg nucleus was apparently long enough in the case of bud pollinations to allow the sperm nucleus to reach

the egg. At the same time open pollination resulted in satisfactory sets, despite the fact that insects did not visit the flowers until after anthesis.

Time and temperature factors in hardening plants, R. B. HARVEY (*Amer. Jour. Bot., 17 (1930), No. 3, pp. 212-217, figs. 2*).—In studies at the University of Minnesota in which the hardiness of Early Jersey Wakefield cabbages was determined by exposure to −5° C. after various hardening treatments, it was found that the threshold value for producing hardiness in this variety was at approximately 5°. Alternate equal exposures, 12 hours at 0° and 12 hours at 10° or 12 hours at 20°, produced greater hardiness than did continuous exposure at the average of these temperatures. The effect of short exposures, 1 to 4 hours per day, at 0° was striking, suggesting that hardening may be a cold shock response not correlated with the product of temperature and time exposure.

Results of sweet-corn suckering experiments on Long Island, H. C. THOMPSON, H. S. MILLS, and P. H. WESSELS (*New York Cornell Sta. Bul. 509 (1930), pp. 11*).—Supplementing earlier studies (E. S. R., 55, p. 536) and reaching the same general conclusion, namely, that suckering of sweet corn is an unnecessary and even deleterious operation, this bulletin discusses results secured at the Long Island Vegetable Research Farm with Golden Bantam for 4 years, Stowell Evergreen for 3 years, and Long Island Beauty for 6 years. In all except one comparison the average yields were highest from the untreated plants. Late suckering was markedly injurious, the odds being 181 : 1, 208 : 1, and 700 : 1, respectively, for Golden Bantam, Stowell Evergreen, and Long Island Beauty. There was no consistent or significant increase in early yield due to the treatment. Size of ears was not significantly influenced by suckering, although late suckering had a small but consistent reducing influence. The beneficial effects were not large in any case, reaching a maximum of about 3 per cent. Removing the suckers decreased the yield of stover in all three varieties, late suckering being most harmful.

The chemical changes in peas after picking, Z. I. KERTESZ (*Plant Physiol., 5 (1930), No. 3, pp. 399-412, figs. 2*).—In studies at the New York State Station it was found that definite chemical changes, the most striking of which is a decrease in sucrose, take place immediately in peas following shelling. The percentage of alcohol-insoluble residue increased, possibly at the expense of sucrose. Even at −20° C. there was observed a marked change in composition, apparently occurring during the brief period before the tissues actually froze. Compositional changes apparently related to respiration were interrupted by drying of the peas. When freshly picked peas were macerated and placed under toluene-water, sucrose and starch decreased and reducing sugars and nonprotein nitrogen increased, indicating that sucrose, diastase, and protease were present and active. The practical significance of the studies is that peas should be cooked promptly after shelling.

Carbon dioxide in relation to glasshouse crops.—Part IV, The effect on tomatoes of an enriched atmosphere maintained by means of a stove, T. SMALL and H. L. WHITE (*Ann. Appl. Biol., 17 (1930), No. 1, pp. 81-89*).—Further studies (E. S. R., 60, p. 320) at the Experimental and Research Station, Cheshunt, England, on carbon dioxide in relation to greenhouse crops are noted. Of three methods, (1) a fermentation process, (2) a portable stove, and (3) acid and sodium bicarbonate, for supplying increased carbon dioxide to the atmosphere, the first appeared inadequate because of the insufficient amount of carbon dioxide added to the atmosphere. With stoves the average increase in the tomato crop was 16 per cent where the stove treatment was continued throughout the growing season, but from an economic standpoint

this increase was not profitable. With the chemical method, acid and bicarbonate of soda, the results were conflicting, a significant crop increase (25 per cent) being obtained in one instance and no benefit in others. Harmful effects were obtained from the placement of stoves in a cucumber house, the authors concluding that the normal carbon dioxide content in such houses is adequate under the weak light conditions obtaining. Mechanical mixing of carbon dioxide with the air of the greenhouse was found nonessential.

The effect of fertilizer on the quality and keeping quality of watermelons, W. D. Kimbrough (*Plant Physiol., 5 (1930), No. 3, pp. 373–385*).—As a result of four years' studies at the Alabama Experiment Station upon the effects of fertilizers on the eating and keeping qualities of watermelons, the author concludes that fertilizers had no appreciable influence. The sugar content varied as greatly between melons with a single treatment as between those with different treatments. Heavy applications of nitrate of soda had no apparent effect on sugar content, although the growth of the plant was materially stimulated. Potash also had no effect on sugar content. In general, quality was determined by sugar content, with moisture inverse to sugar in such a consistent manner that moisture determinations gave a fair estimate of the sugar content.

Stored at room temperatures moisture increased slightly and sugar decreased rapidly, thus accounting for the difference in quality between freshly picked and shipped watermelons. Temperatures as low as 35° F. were not effective in keeping melons in good condition for much more than a month. White heart was not found correlated with fertilizer treatment but is believed due to unfavorable environment or diseased vines.

Firmness and keeping quality of fruits as affected by nitrogen fertilizers, E. S. Degman (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 182–186*).—Studies conducted by the University of Maryland with fruits obtained from apple and peach fertilizer plats located in various parts of the State led to the conclusion that the use of nitrogen fertilizers of various kinds, including nitrate of soda, ammonium sulfate, calcium nitrate, Calurea, Leunasalpeter, and urea, had no consistent effects on keeping quality of apples and peaches as measured by the pressure tester and actual counts in storage. However, it is conceded that when orchard practices, such as pruning, soil management, thinning, and irrigation, are unwisely administered in connection with the use of nitrogen excessively large fruits of lowered keeping quality may result.

The effect of various potash fertilizers on the firmness and keeping quality of fruits, J. H. Weinberger (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 174–179*).—Based on examinations of apples and peaches grown on experimental fertilizer plats in various sections of Maryland, the general conclusion is reached after a careful statistical analysis of results that the use of potassium fertilizers alone or in combination with other elements had no effect on the firmness or the keeeping quality of the fruits. Similar observations were reached concerning the strawberry. A high correlation, +0.962, computed between pressure test readings on peeled and unpeeled peaches showed that there was no need of removing the peel from this fruit, and that the pressure test with adequate numbers per treatment is a reliable index to firmness of the peach. No difference was observed between the effects of the four potash fertilizers used, namely, muriate, sulfate, sulfate of potash magnesia, and manure salts.

Variability and size relations in apple trees, R. C. Collison and J. D. Harlan (*New York State Sta. Tech. Bul. 164 (1930), pp. 38*).—Observing a marked variability in the growth and yield of individual apple trees of a single variety in a single orchard and even between adjacent trees, a study was made of

underlying factors. In a commercial Baldwin orchard it was observed that the outer trees gained more in trunk diameter than interior trees, the gain increasing over a period of 20 years from 0.16 to 1.1 in. per tree. Variability in both yield and diameter growth became less with increasing age and was materially less in a Rome orchard originally planted for experimental purposes than in the commercial Baldwin orchard. Interannual correlations for diameter growth in the Baldwin trees ranged from $+0.896\pm0.010$ to $+0.948\pm0.005$. Interannual correlations for yield of the Rome trees varied from $+0.729\pm0.043$ to $+0.899\pm0.018$. Thus both cases showed a high degree of permanence in the performance of individual trees.

Analyzing the situation in the Rome orchard, topography was considered, with the observation that over 18 years the yields of 50 trees correlated with their elevations gave a coefficient of $+0.313\pm0.086$. Somewhat greater significance was shown in diameter increase for the period 1910 to 1923, the correlation with elevation being $+0.448\pm0.076$. The yields of all the Rome trees correlated with the sand content of the soil under the tree gave a coefficient of -0.280 ± 0.089. In trees receiving no fertilizer the correlation between sand in the soil and yield was -0.537 ± 0.128, in phosphorus-supplied trees -0.592 ± 0.146, and in phosphorus and potassium-supplied trees -0.679 ± 0.121.

As a test of the influence of variability of original seedling stocks, measurements were taken on the growth of selected crab seedlings, and a distinct tendency was noted for the trees to make new growth in proportion to the original size, with some tendency toward smoothing out of these differences.

The reliability of the trunk circumference as an index to growth was seen in a coefficient of $+0.972\pm0.008$ between trunk circumference and total weight of the aboveground portions in the case of 21 McIntosh trees.

The relation of hydrophilic colloids to hardiness in the apple as shown by the dye adsorption test, S. DUNN (*New Hampshire Sta. Tech. Bul. 44 (1930), pp. 18*).—Further studies (E. S. R., 56, p. 43) of a hardiness test dependent on the amount of dye (malachite green) adsorbed by pulverized apple twig tissues led to the general conclusion that the test is not sufficiently consistent to be used as a quick, conclusive determination of hardiness in the apple but may have value when used in conjunction with other tests, such as freezing. The author concludes that other factors besides the hydrophilic colloids are probably concerned with hardiness, at least in woody plants such as the apple.

The results of tests on 1-year-old twigs of 22 varieties grown in Iowa and of direct freezing tests for 2 of the 5 years show a correlation of about 65 per cent of the varieties compared to field experience and 55 per cent in one series and about 80 per cent in the other on the basis of freezing tests. The results of similar tests on 12 New Hampshire apples show a correlation between the dye test and either of the other standards of from 60 to over 90 per cent.

A preliminary study of the factors affecting the red color on apples, L. A. FLETCHER (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 191–196*).—Brief comments are made on the results of a 3-year study of various factors, such as light exclusion, ultra-violet light, artificial feeding of tree and fruit, defoliation and girdling, application of chemicals and fertilizers to the soil, and irrigation, as affecting the color of apples. Of fruits inclosed in red, green, blue, purple, yellow, and transparent cellophane bags, only those under red failed to color, the red apparently absorbing the rays at the blue end of the spectrum. Short exposure of bagged Wealthy apples to ultra-violet light stimulated color development. None of several chemicals, lime, sulfur, citric acid, ferric sul-

fate, ferric carbonate, manganese oxide, potassium chloride, and superphosphate, used in conjunction with nitrate of soda had any apparent effect on color.

Sugar in the form of cerelose applied to the soil about Williams trees enhanced color to a considerable extent, especially when used in connection with a spring application of nitrate of soda. Chemical analysis of the apples showed a higher content of reducing sugars in fruits of trees treated with cerelose and nitrate as compared with cerelose alone. High reducing sugar content was apparently associated with good color development.

With Rome 20 leaves per fruit and with York Imperial 40 leaves per fruit were required to give characteristic color. As defoliation agents 5 per cent solutions of nitrate of soda or of calcium nitrate did not injure the fruit and were effective in removing foliage. Among several chemicals injected directly into the conducting tissues of the tree boric acid, hydrochloric acid, cerelose, and sucrose increased color of fruit, but the first two had injurious effects on the tree.

Some relations of nitrogen to keeping quality of fruit, J. H. Gourley and E. F. Hopkins (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 167–173*).—Chemical and physiological studies at the Ohio Experiment Station upon apples grown with different amounts of nitrogen and other fertilizers showed a significant influence of nitrogen on size, color, water content, nitrogen content, and catalase activity in the fruits but no significant effect on keeping quality nor on internal breakdown. The most striking results were secured with mature Stayman Winesap trees grown in sod, the apples from which showed a marked increase in nitrogen content, whether expressed as the percentage on a fresh weight basis or as grams of actual nitrogen. In many cases the increase of nitrogen was well over 100 per cent. Nitrogen increased with applications up to 8 lbs. of nitrate of soda per tree. Beyond this point there were sometimes actually smaller increases. A close correlation was noted between catalase activity and the percentage of nitrogen in the fruit. Nitrate fertilizers increased the percentage water content and decreased color.

A case of second crop seedless apples, C. B. Wiggans (*Plant Physiol., 5 (1930), No. 2, pp. 273–277, figs. 3*).—Finding that second-bloom Yellow Transparent apples produced at the University of Arkansas orchards in the summer of 1925 were with one or two exceptions seedless, a study was made of the causal factors, leading to the conclusion that seedlessness was due to the abortion of the ovules rather than to parthenocarpy. High temperatures during the second blooming period are believed to have been contributory factors.

A study of some unproductive cherry trees in California, C. F. Kinman (*Jour. Agr. Research [U. S.], 41 (1930), No. 4, pp. 327–335, figs. 6*).—Herein is described an unproductive mutant form of the sweet cherry characterized by defective blossoms and off-type leaves, which though considered as possibly of virus origin behaves from all practical viewpoints as a bud sport. The pistils of the mutant flowers are short and slender, with a tendency to early discoloration, although occasionally normal pistils are seen which may develop into small, rough, misshapen fruits. No evidence was obtained that environment is a factor in causing the phenomenon. On grafting abnormal and normal Black Tartarian scions into small mutant Black Tartarian trees, the resulting growth was found identical with the scion, thus showing no translocation of the abnormality by grafting. Results with budding were the same. Inoculations from abnormal to healthy tissue failed to produce results. Apparently the abnormal form can be eliminated from cherry orchards by the selection of budding wood from normal branches.

The canning quality of certain commercially important eastern peaches, C. W. Culpepper and J. S. Caldwell (*U. S. Dept. Agr., Tech. Bul. 196 (1930), pp. 47*).—Using fruit of eight varieties of peaches grown near Fort Valley, Ga., the authors observed a very definite correlation between the stage of maturity and the behavior of the fruit in canning. In all eight varieties the development of full flavor was associated with full maturity, at which stage total sugars reached a maximum, and acidity and astringency declined. At full maturity natural flavor was at a maximum, and the dissolution of the middle lamellae of the cell walls released the cell constituents. Ripening on the tree was found essential to the development of full quality.

For only a brief period, 24 to 72 hours, was any single peach in prime condition for canning, and the pressure test was found very satisfactory for determining this condition. For effective lye peeling the fruits needed to be firm and yet ripe enough to insure quality in the product. Fruit picked at the proper stage and held at 32° F. for from 15 to 30 days kept firm, with some loss in quality. Of the varieties tested, J. H. Hale was decidedly superior in respect to size, shape, color and flesh texture, rate of softening during ripening, and retention of shape after processing. Elberta was second. Yellow Hiley yielded a product of distinctive flavor but was off shape and too soft. Arp was poor in flavor, in size, and in texture. Hiley was somewhat deficient in flavor and off in size and texture. Early Rose yielded a good quality product but was too small. Belle was generally superior to other white peaches but softened too much in canning. Carman was least promising of all by reason of uneven softening and disintegration during the canning process.

The improvement of Prunus tomentosa, G. L. Slate (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 28–31*).—A study at the New York State Experiment Station of a number of *P. tomentosa* seedlings showed marked variation in time of bloom, color of flower buds, productivity, size and quality of fruit, and vegetative characters, leading to the conclusion that the desirable attributes if combined would result in worthwhile new fruits. Of a population of 1,182, only 2 seedlings were classed as exceptionally good.

Propagation of the low-bush blueberry, A. C. Hildreth (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 91, 92*).—Excellent rooting of cuttings of the subterranean horizontal stems of the low-bush blueberry was obtained by the Maine Experiment Station, especially with cuttings of the smaller diameters. Sandy soil, such as that in which plants grow naturally, proved the best rooting medium.

Experimental studies on the growth and development of strawberry plants, G. M. Darrow (*Jour. Agr. Research [U. S.], 41 (1930), No. 4, pp. 307–325, figs. 9*).—Studies conducted at the Horticultural Field Station, Glenn Dale, Md., during the growing seasons of 1925 and 1926 upon the relation of various climatic factors to the growth of the strawberry plant indicated that temperature is the chief limiting factor. High growth rates were maintained at average mean daylight temperatures of from about 68 to 79° F. Above or below these points leaf production was decidedly lowered. A daylight temperature of about 78° is considered optimum.

Average mature leaf size on spring-set plants attained a seasonal maximum in June, with subsequent decline in leaf size of plants producing runners. A comparable rise and fall in leaf size was also noted in runner plants. In Howard 17 the average length of life of leaves that unfolded between April 1 and July 8, 1925, was 56 days, with a range of from 21 to 77 days. Plants allowed to produce runners showed a gradual increase in total leaf production until about July 8, after which there was a slight decrease. By July 8 the

total leaf production of runner plants equaled that of the mother and by August 20 was about seven times as great. Of varieties studied, Howard 17 was most active and Aroma least active in leaf production. As measured in total leaf production, the vigor of the mother plant was greatly reduced by runner formation. In respect to mean daily increment values of total leaf products, the plants with runners removed showed positive values throughout the season, whereas in 3 of the 17 weekly readings there was actually a loss in the plants with runners.

A study of the origin and development of the cormlet of gladiolus, M. J. T. Geiger (*Diss., Catholic Univ. Amer., Washington, D. C., 1929, pp. 48, pls. 8, figs. 8*).—The results are presented of a histological study upon the gross morphology of the mature gladiolus corm, of factors influencing cormlet production, and of the structure of the cormlet at different stages of growth. Incidentally, it was found that winter forcing inhibited the production of cormlets and contractile roots in the Topaz variety. The contractile roots were apparently important factors in cormlet production, evidently carrying raw materials to the foliage which in turn supplied the organic nutrients used by the developing cormlet.

Do storage conditions influence the growth of the gladiolus, A. M. S. Pridham (*Gladiolus Rev., 7 (1930), No. 8, p. 278*).—Comparing the effects of storage at from 35 to 40° F. and at ordinary house cellar temperatures on the behavior of the resulting plants, it was noted at Cornell University that the quality of the flower spikes was somewhat improved at the low temperature storage of the corms, but that there was no appreciable change in the quantity of flowers. The weight of the new corms was somewhat lower in the low temperature lot, due apparently to the retarded germination.

Shortening the rest period of gladiolus by treatment with chemicals, F. E. Denny (*Gladiolus Rev., 7 (1930), No. 9, pp. 313–318, figs. 3*).—Studies at the Boyce Thompson Institute of various chemical treatments for abbreviating the dormant period of gladiolus corms showed marked differences in the response of varieties to these treatments. For example, when using ethylene chlorohydrin Souvenir, Maiden Blush, and Alice Tiplady responded to treatments applied within a week after harvest, while Halley did not respond until a month after harvest and Remembrance at no stage in the rest period. Not more than 50 per cent of the forced corms developed good flower stalks, due in the author's opinion to unfavorable light conditions prevailing in the winter rather than to injuries from the chemicals. Ethylene chlorohydrin increased the number of sprouts per corm, particularly in the Alice Tiplady variety. Ethylene gas and warm temperature storage were not found effective in abbreviating the rest period of freshly dug corms but had a favorable effect later.

Experiments in forcing gladioli, F. F. Weinard and S. W. Decker (*Illinois Sta. Bul. 357 (1930), pp. 343–361*).—Various factors concerned in the production of forcing gladiolus corms and various artificial treatments designed to hasten growth resumption are discussed. Young corms 1.5 in. or more in diameter were found desirable for forcing. Corms taken from cold storage started growing somewhat tardily, and those stored too warm tended to produce blind shoots, leading to the recommendation of a 40 to 45° F. temperature in early storage followed by a short preplanting period at 70° or higher.

Flowering of early planted corms was stimulated by artificial lengthening of the daylight, but the process was found too costly for everyday use. Early planting of fall-dug corms was not advised on account of the delayed germination and the considerable percentage of blind shoots. Corms were forced into

early growth with various chemicals, such as ethylene dichloride and ethylene chlorohydrin, but the process is not sufficiently standardized for universal use. Holding over corms for early planting the second season was not found practical.

Summer-budded versus winter-grafted roses, F. F. WEINARD and S. W. DECKER (*Illinois Sta. Bul. 358 (1930), pp. 363–373, figs. 4*).—Seeking to determine the comparative value in flower production of summer-budded and winter-grafted roses, plants of Matchless, Mme. Butterfly, and Templar, all on Manetti stock but propagated in both of the above ways, were grown in the greenhouse and records taken of stem length and number of blooms. The records showed that well grown summer-budded plants were quite as valuable, both in respect to number and quality of flowers, as were the winter grafts. There was some indication of differences in varietal response to the two types of propagation.

Rose culture, A. H. MACLENNAN and P. B. SANDERS (*Ontario Dept. Agr. Bul. 353 (1930), pp. 46, figs. 27*).—With supplementary information on rose insects by L. Caesar and on rose diseases by J. E. Howitt, this paper presents a comprehensive discussion of roses and their culture.

FORESTRY

The production, extraction, and germination of lodgepole pine seed, C. G. BATES (*U. S. Dept. Agr., Tech. Bul. 191 (1930), pp. 92, pls. 3, figs. 21*).—Lodgepole pine seeds were found to average about 100,000 per pound, with a range between 85,000 and 160,000. Good quality seeds were marked by a black or slightly grayish color, brown being an indication of low vitality due to immaturity. Size of seed did not appear to be an important factor. Climatic factors were closely related to seed production, since in Wyoming where the stand favored seed production yields were less than in central Colorado under less favorable conditions. In the Rocky Mountain region lodgepole pine was a better seed producer than either western yellow pine or Douglas fir. The habit of retaining several years' cones favored reproduction of lodgepole pine following fires. Seed production was not periodic but was apparently influenced by temperature at the time cone flowers emerged. Dominant large-crowned trees produced the best crops quantitatively but not necessarily qualitatively, making it possible to leave intermediate trees as seed parents.

The use of high temperature with adequate ventilation was successful in opening cones, the process being apparently directly due to a water loss. An extracting temperature not exceeding 140° F. was indicated for fresh cones, whereas with decidedly dry cones a temperature of 170° was safely used and was more effective. Considering all factors, from 4 to 6 months of moderate air drying gave the best yields and quality. It is believed that lodgepole pine seeds do not mature completely in their second year and are benefited in this respect by the application of heat and removal of moisture. In the final stages of treatment artificial heat apparently produced certain chemical changes in the seed and probably in the cones.

The essentials for securing standard germination included a fluctuating temperature ranging from 57 to 83° F. and a fluctuating moisture content of from 6 to 10 per cent in the medium. Even under optimum conditions lodgepole pine seeds were slower in germination than were western yellow and bristlecone pines, Douglas fir, and Engelmann spruce. The better seed germinated more quickly and reached a higher and earlier maximum. Scarcely more than 75 per cent germination was attained under the most ideal nursery conditions.

Wyoming seeds completed 44 per cent of total germination in the first year as compared with 67 per cent for Colorado seeds, but when sown at the place of origin the Wyoming seed in two years germinated quite as well as did Colorado seed. The importance of obtaining seeds adapted to local conditions is stressed, and an appendix describes a model seed-extracting plant, a mechanical kiln, and cone-drying sheds.

Experiments in the use of fertilizers in growing forest planting material at the Savenac Nursery, W. G. WAHLENBERG (*U. S. Dept. Agr. Circ. 125 (1930), pp. 38, figs. 11*).—Following earlier experiments at the Savenac Nursery, Haugan, Mont., in which there was observed a stimulated growth of pine seedlings from the use of nitrogen fertilizers but with some indication of loss of resistance to adverse conditions, more intensive experiments were conducted with Engelmann spruce, yielding very favorable results. With moderate amounts of dried blood and bone meal or heavy applications of sheep manure, the 5- to 6-year period usually required for producing suitable planting material was reduced by at least 1 year. It was found that nitrate of soda in solution could be used advantageously as a stimulant for 2–0 Engelmann spruce, thus eliminating the weaker and crowded individuals and strengthening the dominant ones. Of 21 trials of various mixtures of three common fertilizers, the best western yellow pine seedlings were obtained with fairly large proportions of nitrate of soda mixed with moderate or small quantities of superphosphate or muriate of potash, or both. In tests with western yellow pine the best results were secured with a heavy application of superphosphate, bone meal, tankage, and guano containing 4.6 per cent of nitrogen and 9.8 per cent of phosphorus. A heavy application of dried blood and ground bone mixed in the ratio of 2 : 1 was second in effectiveness, and ammonium sulfate was third. In general fertilizers high in nitrogen gave best results and animal manures were slow to act, but their value in the maintenance of soil fertility is admitted.

The determination of hour control for adequate fire protection in the major cover types of the California pine region, S. B. SHOW and E. I. KOTOK (*U. S. Dept. Agr., Tech. Bul. 209 (1930), pp. 47, figs. 32*).—Analyzing the data obtained from reports of the U. S. D. A. Forest Service on fires and their control, information is herein presented on the speed of attack factor in fire control commonly termed "hour control," and including the total time elapsing from the inception of the fire until actual suppression starts.

Dividing California pine forest types into western yellow pine, mixed conifer, Doublas fir, sugar pine fir, pure fir, brush field, chaparral, woodland, and grass, the authors established the fact that the attack necessary to secure minimum burned area must be most rapid in the yellow pine, mixed conifer, brush, woodland, and grass types. The lowest percentage of fires reached in one hour was in the white fir type, with Douglas fir next. It was evident that data should be taken from the difficult fire-control years, and only man-caused fires were considered. In the more inflammable types on bad days it was evidently necessary to reach the fire in one hour in order to have a chance of keeping it within limits, and even then some dangerous fires developed.

Travel occupied a major portion of the period elapsing between discovery and commencement of attack. In automobile the average distance that was covered in one-half hour was 5.25 miles, horse 3.25 miles, and on foot 0.5 mile. The relative accessibility of the different forest types by auto is thus shown to be a very important factor in rapidity of attack.

In concluding, the authors advise the need of further analyses of practical forest-fire experiences in order to develop scientific methods of attack.

Profits from farm woods: Money-making examples from southern farmers, W. R. Mattoon (*U. S. Dept. Agr., Misc. Pub. 87 (1930), pp. II+18, figs. 20*).—Brief accounts are given of ways and means that various individuals employed in making a success of their farm woods enterprises.

Ohio Forest News, [May and July, 1930] (*Ohio Forest News [Ohio Sta.], Nos. 9 (1930), pp. 8, fig. 1; 10 (1930), pp. 12, figs. 11*).—These numbers contain general notes on forestry and related activities.

DISEASES OF PLANTS

Notes on plant diseases in 1927, H. Wormald (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 111–118*).—Besides plant diseases previously reported, some accounts of which have been noted (E. S. R., 56, p. 747; 60, p. 830), the author records some which came under notice during the year, including cherry witches' broom (*Exoascus cerasi*), plum scab (*Cladosporium carpophilum*), tomato leaf mold (*Cladosporium fulvum*), parsnip downy mildew (*Plasmopara nivea*), onion downy mildew (*Peronospora schleideni*), potato powdery scab (*Spongospora subterranea*) mint rust (*Puccinia menthae*), and rhubarb rust (*Puccinia phragmitis*).

Some aspects of plant pathology in China, R. H. Porter (In *Proceedings of 3. Pan-Pacific Science Congress, Tokyo, 1926. [Tokyo: Natl. Research Council of Japan], 1928, vol. 2, pp. 2091–2097*).—Because plant diseases are limiting factors in food plant production in China and because this fact has received inadequate recognition, this paper briefly draws attention to crop losses due to diseases and mentions with brief discussion some of the factors bearing directly on methods intended to reduce such losses.

The first step deemed necessary is a comprehensive plant disease survey in as many type areas as possible. The second step is to apply to Chinese conditions, so far as practicable, the fundamental principles of disease control at present known elsewhere. The cereal smuts, widespread and destructive in China, are morphologically much the same as elsewhere, but little is yet known of the physiological reactions. Many seed disinfectants used elsewhere are too expensive to use in China. The advantages of dust seed treatments are indicated. Tests are under way for millet smut control, seeking a better adapted treatment than that with formaldehyde. Researches on certain diseases which are or may be more serious in China than elsewhere are needed.

[Report of the] pathological division, J. R. Weir (*Rubber Research Inst. Malaya, Ann. Rpt. 1928, pp. 61–95*).—In addition to a general statement as to the progress of research on the major projects, a brief review is given of work with plant diseases.

Asterocystis radicis [trans. title], A. L. Guyot (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 2, pp. 79–93, figs. 12*).—A systematic and biological study of *A. radicis* is presented, along with some account of facts bearing upon the activities of that fungus in connection with plants in genera representing widely separated families.

Polygonum lapathifolium Ait. as host of Puccinia polygoni-amphibii [trans. title], A. J. Rainio (*Ann. Soc. Zool. Bot. Fennicae Vanamo, 9 (1929), pp. 250–255; Finn. abs., pp. 254, 255*).—The surroundings and conditions are given, with accounts of related forms.

Hadromycoses, J. and M. L. Dufrenoy (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 3, pp. 195–212, pls. 2, figs. 16*).—Calling attention to that class of plant diseases in which fungi infect or poison selectively and change

in a characteristic way, as described, tissues (particularly ligneous), and crediting Pethybridge with the introduction of the term "hadromycose" as descriptive of such occurrence and associated features in an account of his own study of potato verticilliose, the authors note the considerable economic importance of hadromycoses and, in general, of Verticillium diseases of certain economic plants.

Verticillioses are described, as are also various species of Verticillium, with an account of the polyphagia of that genus. It is thought that under natural conditions a lack in the soil of certain necessary constituents may leave the plants in a condition more sensitive than is normal to infection by Verticillium. Recommendations are offered.

Measuring the efficiency of the spray program, W. H. Thies (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 329–331*).—"It is the purpose of this paper to suggest a simple workable method of checking over the crop at harvest time for the purpose of determining the degree of success or failure of the spray program. . . . One of the most outstanding observations in Massachusetts this year is that the russet on Baldwins which has been attributed so largely in years past to faulty spraying, is, in part at least, the result of unfavorable weather." Details and bearings are discussed.

Bordeaux mixture in combination with arsenical sprays, W. Goodwin and H. Martin (*Jour. Agr. Sci. [England], 18 (1928), No. 3, pp. 460–477*).—The interaction of Bordeaux mixture with lead arsenate and with calcium arsenate has been studied by an examination of the effects produced when hydrated lime is added to the arsenical compounds, also when copper sulfate is added to the arsenical compounds and hydrated lime.

The interaction in case of calcium hydroxide and diplumbic hydrogen arsenate appears very complex, resulting in the decomposition of part of the lead arsenate and the formation of basic calcium arsenates. No support was found for the view that calcium carbonate decomposes diplumbic hydrogen arsenate with the production of soluble arsenic compounds. When the lead arsenate, in water, is allowed to interact for long periods with excess of hydrated lime, the production of basic calcium arsenates brings large proportions of arsenic into solution by the action of carbon dioxide. When calcium hydroxide is converted rapidly with the formation of calcium carbonate, the proportion of arsenic rendered soluble is small.

It is concluded that in actual spraying there is a definite lessening of the risk of arsenical injury when hydrated lime is added to lead arsenate and to calcium arsenate, and also that when the conditions are such that the addition of hydrated lime brings about a reduction of arsenical injury, the use of an "equal-lime" Bordeaux mixture containing an equivalent amount of calcium hydroxide will prove far more effective.

The effect of copper carbonate on covered smut Ustilago hordei of hulless barley, R. H. Porter (In *Proceedings of 3. Pan-Pacific Science Congress, Tokyo, 1926. [Tokyo: Natl. Research Council of Japan], 1928, vol. 2, pp. 2098–2102*).—As the result of one year's testing for control of covered smut on hull-less barley, it is stated that copper carbonate (both commercial and prepared), dry and liquid Tillantin, dry and liquid copper sulfate, and hot and cold formaldehyde solutions all practically eliminated covered smut from infected barley seed, and produced a clean crop. Details are given. Copper carbonate is easily applied to the seed and its cost is reasonable, making this treatment suitable for control of covered smut.

Infection of wheat while heading [trans. title], A. Milan (*Nuovo Gior. Bot. Ital., n. ser., 34 (1927), No. 3, pp. 630, 631*).—This preliminary note indicates that wheat at the heading stage may be infected with Tilletia.

The bacterial blight of beans caused by Bacterium phaseoli, W. J. ZAUMEYER (*U. S. Dept. Agr., Tech. Bul. 186 (1930), pp. 36, pls. 2, figs. 10*).—Finding from surveys that bacterial blights were the principal diseases of beans in Wisconsin, a study was made of *B. phaseoli*, a widely distributed seed-borne organism. It was observed that varieties differed markedly in resistance, and that none were completely immune, although four varieties of the Refugee type showed high resistance. Infection was greatly influenced by moisture, being high in plants placed in a saturated atmosphere with the proper light and temperature. It was observed that local dissemination was brought about by dew, rain, surface water, wind, insects, etc., and that infection could be spread in the process of inoculating seed with nodule bacteria.

Bacteria entered the leaf through the stomata and invaded the intercellular spaces, causing a gradual dissolution of the middle lamella, followed by cell disintegration with the formation of bacterial pockets. Bacteria entered the stem through the stomata of the hypocotyl and epicotyl, through the vascular elements leading from the leaf to the stem, or from infected cotyledons. In cases of severe infection seedlings exhibited wilting caused either from the plugging of the xylem vessels or the disintegration of the cell walls. Little infection was observed in the secondary xylem because of the composition of the wall material.

No case of direct penetration of the seed coat was noted, the bacteria passing into the sutures of the pods from the vascular system of the pedicel and making their way into the funiculus and thence through the raphe leading into the seed coats. Bacteria also gained entry through the micropyle. Once beneath the seed coats, the bacteria may pass into the region of the cotyledon and into the cotyledon itself through lesions caused in the process of cell enlargement. The solution of much of the cotyledonary substance following germination is believed to influence bacterial action.

Beet curly top [trans. title], J. WILLE (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 1, pp. 115–167, figs. 8*).—The increasing distribution of the beet leaf bug (*Piesma quadrata*) carrying curlyleaf of that plant and the severe injury caused by that condition show the importance of the disease and the danger to the sugar interests in Germany.

Factors regarded as significant in this connection are the number of bugs, the time of their attack, and the age of the plants at that time. Primary and secondary phenomena are descriptively distinguished as separated by the length of the incubation period. Measures recommended have for their end only the control of the insects.

Crown gall of red beet [trans. title], A. J. RAINIO (*Ann. Soc. Zool. Bot. Fennicae Vanamo, 9 (1929), pp. 255–257, fig. 1; Finn. abs., p. 257*).—A deformation of red beets, claimed to agree with that caused elsewhere by *Bacterium tumefaciens*, is described. It is said to have affected as large a part as one-tenth of the crop in localities indicated.

Black-rot of cabbage and its control, W. J. BACH and J. J. TAUBENHAUS (*Texas Sta. Circ. 57 (1930), pp. 10, fig. 1*).—A general discussion of the nature, prevalence, transmission, and control of black rot of cabbage. At the Weslaco Substation in crops harvested on January 8, 1929, there was recorded as high as 25.81 per cent of the mature cabbage heads as infected with black rot. The disease was found also on broccoli seedlings, cauliflower, Brussels sprouts, turnips, and white varieties of radish. Treatment of the seed with bichloride of mercury solution is recommended as a control.

Note on "black rot" of cruciferous plants, H. WORMALD and A. M. FRAMPTON (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927),*

pt. 2, pp. 108–110, pl. 1).—In October, 1925, leaves of young crucifers (broccoli) in seed beds showed symptoms corresponding to those of the cruciferous black rot (*Pseudomonas campestris*=*Bacterium campestre*) as known in America, and the organism, studied comparatively, proved to be practically indistinguishable from the type obtained for that purpose from the U. S. Department of Agriculture. Though apparently not so virulent as in the United States, the organism is so distributed in the British Isles as to cause sometimes serious loss.

Seed disinfectants for the control of kernel smut of foxtail millet, R. H. PORTER (In *Proceedings of 3. Pan-Pacific Science Congress, Tokyo, 1926. [Tokyo: Natl. Research Council of Japan], 1928, vol. 2, pp. 2103–2107*).—Millet kernel smut, *Ustilago crameri*, is said to be an important disease and a factor limiting production in north China, where millet constitutes one of the main food crops of people who can not afford to use wheat flour. In the summer of 1925 smut was very prevalent around Weihsien, Shantung, being present in almost every field in varying percentages, mostly not over 15 or 20 per cent, but in one case over 50 per cent.

The results are given of a trial during one year. Millet seed from a field showed an infection rate of 26.8 per cent of the heads. Seed selected from a badly smutted field before harvest reduced the smutting by 26.2 per cent in the succeeding crop and increased the yield by 5.3 bu. per acre. Dry Tillantin, cold formaldehyde, dry Uspulun, and copper carbonate all reduced the amount of smut to a point below 5 per cent and increased the yield from 3.1 to 4.6 bu. per acre. Uspulun solution of 0.3 per cent, applied for one hour, failed to control millet smut satisfactorily.

Further studies are considered necessary.

Some conditions affecting the storage of peppers, J. I. LAURITZEN and R. C. WRIGHT (*Jour. Agr. Research [U. S.], 41 (1930), No. 4, pp. 295–305, pl. 1*).—A study conducted by the Bureau of Plant Industry, U. S. D. A., upon the injuries produced in garden peppers by freezing and by the fungus Botrytis showed rather distinct types of lesions. Those produced by freezing had a water-soaked appearance, were darker green than the normal fruit, and were very indefinite in outline, while the Botrytis wounds, on the other hand, were very definite in outline and had a creamy, buffy olive color. Botrytis infection developed from inoculation and also normally at temperatures ranging from 0 to 13° C. Infection usually but not always developed in peppers stored at temperatures fluctuating from 0 to 2° for a few weeks. A temperature of 4.5° was more favorable for infection than either 0 or 10°, notwithstanding the fact that the optimum temperature for the growth of the fungus was about 25°. The time required for the initial infection to occur at 0° was about 32 days, and at 4.5 and 10° about 18 days. That humidity was a factor in infection was shown in a numerical increase in infections at all three temperatures, with increased relative humidity.

Anthracnose developed on contaminated peppers at all temperatures employed from 0 to 13°, the time required for infection decreasing with a rise in temperature. Numerically anthracnose infection was greater at 4.5 and 10° than at 0°. No consistent relation between relative humidity and anthracnose infection was established at any of the temperatures utilized.

A temperature of 0° and a relative humidity of 90 per cent offered the best environment for keeping peppers, the actual freezing point of which was −1.06°. Very little ripening occurred in 39 days' storage at temperatures between 0 and 4.5°. Humidity appeared to have no influence on ripening but did have a material effect on shriveling, the time required for shriveling to occur decreasing with the lowering of the humidity.

Phytophthora infestans in potato [trans. title], J. SZYMANEK (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 4, pp. 213–282, pls. 4, figs. 31*).—A review, both historical and bibliographical, is given, with a systematic account of studies on *P. infestans* in different parts of the potato, the biology of the fungus, and its relations to potato varieties.

Study of the morphological structure of the mycelium of *P. infestans* in potato plants shows it to be constant from organ to organ, though the mycelium is provided with absorbing organs of various forms, which are described along with other features and phenomena of the association between host and parasite. Differences in resistance offered by the potato plant to this parasite are attributed chiefly to differentiation in anatomical structure in the tissues, supposedly implying also differences in chemical composition.

The symptoms of spindle tuber and unmottled curly dwarf of the potato, R. W. GOSS (*Nebraska Sta. Research Bul. 47 (1930), pp. 39, pls. 7*).—Working solely with the Bliss Triumph potato, careful studies were made of the symptoms of spindle tuber and of unmottled curly dwarf which led to the general conclusion that the plant character as a whole rather than any individual symptom must be relied upon to distinguish these two diseases, which were for a time considered identical. In general, unmottled curly dwarf was manifested in a more intense development of the symptoms.

The same situation obtained with the tuber infections. Eye characters were found to be the most constant symptoms and were less subject to environmental effects than the tuber shape. While of great value in separating healthy from infected tubers, the eye characters alone were insufficient to separate the two diseases.

Following a long rest period, unmottled curly dwarf symptoms were more pronounced in the resulting vines. Tuber symptoms of both diseases were increased with high soil moisture content, and high soil temperature had the same effect. A development of sprout tubers by unmottled curly dwarf seed and a lack of apical dominance with both diseases were observed. Breaking the rest period of seed tubers obscured the retardative symptom but did not modify either the vine or the tuber symptoms. Tubers affected by either disease had a low respiratory activity, and in chemical studies the infected tubers in both diseases showed a larger content of nitrates but with such high variability that this could not be utilized as a symptom.

Wart disease infection tests, H. BRYAN (*Jour. Agr. Sci. [England], 18 (1928), No. 3, pp. 507–514, pls. 2*).—Improvement as regards rapidity and reliability has been sought in methods of determining reactions of potatoes to wart disease (*Synchytrium endobioticum*) under indoor conditions. Related work has been reported by Glynne (E. S. R., 55, p. 751), the method consisting in the inoculation with summer sporangia of the clean young sprouts growing from the tubers. A practical adaptation of this method is described which has been adequately tested and is regarded as dependable.

Bacterial leaf-blight of the rice-plant, S. ISHIYAMA (In *Proceedings of 3. Pan-Pacific Science Congress, Tokyo, 1926. [Tokyo: Natl. Research Council of Japan], 1928, vol. 2, p. 2112*).—Rice bacterial leaf blight, said to be widespread and often seriously injurious in central and southwest Japan, is stated to have been proved to be due to a parasitic organism here briefly described under the name *Pseudomonas oryzae*, and said to belong, according to the most recent chart of the Society of American Bacteriologists, under the index number 5020/31005/X222.

Comparative studies on the Helminthosporium diseases of rice in the Pacific regions, Y. NISIKADO (In *Proceedings of 3. Pan-Pacific Science Con-*

gress, Tokyo, 1926. [Tokyo: Natl. Research Council of Japan], 1928, vol. 2, p. 2113).—*Helminthosporium oryzae*, named as the cause of the so-called "sesame-like leaf blight" said to have been first described as in Java but at present known in almost all rice-growing regions of the world, has been identified in pure cultures of material from various localities. Of pure cultures from America, the Philippines, Java, and Japan, only those of American and Japanese origin produced the characteristic spores, which are described with their variations.

As the outcome of study of differences, it is claimed that the Helminthosporium of Japanese origin is morphologically and physiologically different from the American form, though the pathogenicity is alike in the two. "Hence it is probable that what is apparently the same leaf spot disease of rice is caused by two or more strains of *H. oryzae*."

An outline of experimental studies on the "indefinite" diseases of the rice plant, T. Hemmi (*In Proceedings of 3. Pan-Pacific Science Congress, Tokyo, 1926. [Tokyo: Natl. Research Council of Japan], 1928, vol. 2, pp. 2108–2111, fig. 1*).—Studies are described as partly carried out in 1925 and 1926 attempting to identify the fungi causing what have been grouped together by writers as the indefinite diseases of cereals. Partial and preliminary records are tabulated of the results of inoculation experiments with *Piricularia oryzae*, *Helminthosporium oryzae*, and *Hypochnus sasakii*. Supposedly, root parasites deteriorate cereal yields materially. Rice seedlings may be attacked in unfavorable seed beds by many fungi.

Virus diseases of tobacco in Kentucky, E. M. Johnson (*Kentucky Sta. Bul. 306 (1930), pp. 285–415, pls. 20*).—A total of 18 single and 2 mixed viruses were studied as to their prevalence, transmissibility, and host range. From the symptoms produced by the viruses on the various hosts there is developed a key to aid in identification. Of the viruses described the severe and mild mosaics are said to be common in Kentucky tobacco fields, the yellow and ring mosaics rare, and the existence of the white mosaic as a distinct tobacco disease is deemed doubtful. Etch, etch+, and veinbanding occurred usually in areas where vegetables, especially potatoes, had been grown and where solanaceous weeds occurred. The wide distribution of ring spot and coarse etch suggested that these viruses may have a wide host range. The possibility that many viruses may overwinter in perennial solanaceous weeds was indicated in the extraction therefrom of eight types. Viruses which affect tomato and pepper were often obscure in the host plant but were easily distinguished upon transfer to tobacco plants. Two diseases of tobacco thought to be caused by distinct viruses were found upon inoculation tests to consist of a mixture of two separate forms.

Observations indicated that the viruses may be transmitted by insects, and the spotted and the striped cucumber beetles, flea beetles, leafhoppers, and aphids are suggested as carriers. White mustard, radish, turnip, pea, bean, rutabaga, kale, and soybean were not found to be susceptible to any of the viruses studied. Cucumber mosaics and "healthy potato" virus caused local infections on beet leaves.

Brown rot of apples: The need for careful picking and sorting, H. Wormald (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 119, 120, pl. 1*).—Recording observations made at East Malling in 1926, the author states that early in September apples of the variety James Grieve showed pronounced brown rot (*Sclerotinia fructigena*) within about two days of the time of picking and grading. This rot nearly always started at the stalk end and in fruits which had been pulled away from the stalk. In this variety

the rot often extends from the fruit into the spurs and even into the branches to form cankers. Data are given on the rapidity of spread and the relation of this rot to marketing.

Preliminary report on the incidence and control of apple scab and apple mildew, A. M. Frampton (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 96–107*).—Trials were conducted with Cox Orange and Stirling Castle, apple varieties very susceptible to spray injury, standing in alternate rows since 1922 on a number of different stocks.

Cox Orange is very susceptible to wood infection by the scab fungus, but is greatly influenced in this respect by the stock. It was controlled on the foliage for seven weeks by a preblossom application of either lime sulfur 1:29 or Bordeaux mixture 8–8–100, the former being slightly more effective. A later application (after blossoming) of lime sulfur 1:100 or of Bordeaux mixture 8–25–100 proved similarly beneficial, the Bordeaux mixture excelling. Lead arsenate showed no appreciable influence on the fungicidal properties of either mixture. The strength of colloidal sulfur used did not control scab. No influence of the stock on the susceptibility of the foliage of the scion to infection by the scab fungus could be detected. No damage to the foliage was caused by the preblossom spray with Bordeaux mixture 8–8–100. The lime sulfur preblossom spray 1:29 scorched the young leaves, but caused no defoliation. The preblossom application of both lime sulfur 1:100 and Bordeaux mixture 8–25–100 caused much falling of the older leaves, Bordeaux mixture causing far less defoliation of the younger leaves. Apparently one application of Bordeaux mixture protected the foliage to some extent against injury from a second application. Probably the stock exerts some influence on the amount of spray injury.

On Stirling Castle a preblossom spray with ammonium polysulfide 1:100 caused no leaf damage. A preblossom spray with lime sulfur 1:29 scorched young leaves but caused no defoliation. A postblossom spray with lime sulfur 1:100 and with colloidal sulfur caused considerable dropping of young leaves. A postblossom spray with ammonium polysulfide 1:200 caused less leaf fall than that due to lime sulfur 1:150. A postblossom liver of sulfur application caused little defoliation. No significant difference was observed between the damage due to one and two applications of any treatment. No conclusions are warranted by the data with regard to the influence of the stock on the amount of spray injury.

Corticium centrifugum, a heterothallic pathogene of apples, L. F. Butler (*Jour. Agr. Research [U. S.], 41 (1930), No. 4, pp. 269–294, pl. 1, figs. 2*).—Studies of the apple diseases known as Hypochnus rot, fisheye rot, and false anthracnose led to the conclusion that these rots are identical and are caused by a single fungus, here identified as *C. centrifugum*. This is found to be widespread, having been collected in New York, Oregon, and Washington, and undoubtedly occurring elsewhere. Decay progresses in cold storage at a temperature of 32° F., with indications that infection occurs in the orchards and that the disease develops but does not subsequently spread in storage. On artificial media, the author observed that vegetative growth is favored by high humidity and inhibited by desiccation.

The fungus was found to be heterothallic, with individual perfect strains producing four types of haplonts. The results of crossing studies conducted with sterile strains accord with the findings of other workers upon other Hymenomycetes. The identity of eastern and western strains of the fungus was substantiated by the results of crossing of sterile strains.

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A method of modifying the lime-sulphur-lead arsenate spray to reduce foliage injury in the apple, W. C. DUTTON (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 332, 333*).—"This modification [which is discussed] consists simply of combining a small amount of ferrous sulfate with the lime sulfur and lead arsenate."

Effect of storage temperature on soggy breakdown of Golden Delicious apples, H. H. PLAGGE (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 298–300*).—Soggy breakdown of Golden Delicious apples, first noted in 1925 and definitely separated by experimental evidence from soft scald in the season of 1926, appears to be of considerable importance commercially in this variety, which appears very susceptible unless put into storage immediately after picking. A temperature of 36° F. is considered best for storage. Susceptibility appears to be increased in a rather definite proportion to the lowering of the storage temperature and also to the lengthening of the delayed storage period. No disadvantages of storing Golden Delicious apples at 36° were apparent when the fruit was sound and had been wrapped in oiled paper.

Bacterial diseases of stone-fruit trees in Britain.—I, Preliminary note on bacteriosis in plum and cherry trees, H. WORMALD (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 121–127, pls. 2*).—Experimentation having shown that bacteria may cause in plum trees a shoot wilt, in cherry trees gummosis and leaf spot, and in both a bacterial canker, descriptions are given, and the relation between the disease stone-fruit tree dieback and that here described as bacterial canker is briefly discussed.

Further notes regarding peach rust control, W. P. DURUZ (*Amer. Soc. Hort. Sci. Proc., 25 (1928), pp. 333–337*).—This, the second report on the control of peach rust (*Tranzschelia punctata*) by spraying (E. S. R., 59, p. 746), deals with the second year's work, which has been conducted along three lines—survey of commercial spraying, field studies of the fungus, and intensive spraying experiments.

The favored midsummer canning clingstone varieties Paloro, Peak, Hauss, Gaume, Johnson, Walton, and Sims are susceptible. Tuscan and Phillips are not so readily attacked.

The rust usually attacks first the twigs, second the leaves, and third the fruit. It overwinters in the new twigs and sporulates early in the spring. The fruit infection is the most important stage from an economic standpoint.

It was found that all early fall sprays gave good control. The late fall applications alone are not effective. Two applications at certain times are more effective than one, this fact supposedly being due to the killing of successive crops of spores in the bark pustules. The best and most uniform control was given by a liquid lime sulfur, full dormant strength. Little difference was apparent between the effectiveness of the other sulfur sprays in any one lot. Bordeaux mixture applied early in the fall seemed to be about as effective as the sulfur sprays, whereas in the late fall or spring it was not as effective as the full strength liquid lime sulfur.

From these and related experiments it is concluded that the time of application of sprays is of most importance in the control of peach rust, early fall spraying being preferable regardless of material or dilution. In general, however, liquid lime sulfur has appeared most consistent in its effectiveness against peach rust when applied at various times.

The pathology of the raspberry: A summary of results of recent research at East Malling, R. V. HARRIS (*East Malling [Kent] Research Sta. Ann. Rpt., 14–15 (1926–1927), pt. 2, pp. 128–134*).—Research was carried on during the period October, 1924, to October, 1927, on raspberry blue stripe wilt

(*Verticillium dahliae?*), cane spot (*Plectodiscella veneta?*), spur blight (*Didymella applanata*), and mosaic. These are discussed in brief systematic detail.

Internal decline (endoxerosis) of lemons, V, VI, E. T. BARTHOLOMEW (*Amer. Jour. Bot. 15 (1928), Nos. 8, pp. 497–508, fig. 1; 9, pp. 548–563, pls. 2*).—A continuation of studies previously noted (E. S. R., 58, p. 250).

V. *Concerning the comparative rates of water conduction in twigs and fruits.*—The author followed up the previous finding that the inherent water-conducting capacities of the lemon twigs bearing endoxerotic fruits were different from those of healthy twigs. Those twigs that had borne healthy fruits withdrew almost twice as much water from the potometers as did those that had borne endoxerotic fruits. This difference was corroborated by tests forcing gases through the healthy and through the endoxerotic twigs, except apparently in those portions within from 2 to 6 cm. of the fruit, which conducted equally in that portion of the endoxerotic and the nonendoxerotic twigs.

Rather limited tests indicated that the open segments of the vessels in the xylem of twigs one year old ranged from 10 to 40 cm. in length, that in the older xylem the disintegration of cross walls gives longer open vessel segments, and that existing cross walls hinder the gas movement.

A special series of tests on healthy twigs showed that gas under pressure passes through the xylem and not through the intercellular spaces in the parenchyma of bark or pith, also that both young and old xylem apparently conduct the gas equally well. Tyloses were not found in any of the twigs.

VI. *Gum formation in the lemon fruit and its twig.*—The gum in the vessels of endoxerotic lemon fruits and in the vessels at the distal end of the twigs materially retarded the rate of entrance and exit of water into and from the fruits, the rate at which the twigs withdrew water from potometers, and the rate at which gas could be forced through the twigs. Locations and formations of the gum are detailed.

Oak Oïdium [trans. title], J. RAYMOND (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 2, pp. 94–129, figs. 25*).—The author presents a somewhat comprehensive and largely bibliographical review of oak Oidium and the causal organism commonly called *O. quercinum* in Europe, with discussion of related or identical forms, notably *Microsphaera quercina*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Game laws for the season 1930–31: A summary of Federal, State, and Provincial statutes, F. L. EARNSHAW and F. G. GRIMES (*U. S. Dept. Agr., Farmers' Bul. 1647 (1930), pp. II+46*).—This, the thirty-first annual summary of Federal and other game laws and regulations (E. S. R., 62, p. 240), has been prepared for the use of law-enforcement officials, sportsmen, conservationists, and others as an aid in the administration of the migratory-bird treaty and Lacey Acts.

Snakes of Utah, H. J. PACK (*Utah Sta. Bul. 221 (1930), pp. 32, figs. 11*).—This is a compilation by G. F. Knowlton of information on the snakes of Utah taken from a manuscript of the late author. A key to the families and genera of Utah snakes, first presented, is followed by a brief descriptive account of the families and genera of the species, 19 in number, known to occur in the State, with notes on their occurrence, characteristics, and habits. A glossary of technical terms and a bibliography of six pages are included.

[Economic insects] (*Calif. Dept. Agr. Mo. Bul., 19 (1930), No. 3–4, pp. 208–238, 239–248, 249–281, figs. 54*).—Brief accounts are given of some of the more

important economic insects and means for their control, including the following: The Colorado Potato Beetle (*Leptinotarsa decemlineata* Say), by A. G. Ruggles (pp. 208–211); The Mexican and Thurberia Cotton Boll Weevil, by J. W. Folsom (pp. 212–215); Fluorine Tested for Use as Insecticide (p. 215); The Japanese Beetle (*Popillia japonica* Newman), by C. H. Hadley (pp. 216–219); The Asiatic Beetle, by R. B. Friend (pp. 220–222); The Vegetable Weevil, by H. C. Lewis (pp. 223–226); The Strawberry Root-Weevil, by J. Wilcox (pp. 227–230); The Alfalfa Weevil, by G. G. Schweis (pp. 231–234); New Jersey Almost Rid of Gipsy Moth (p. 234); The Mexican Bean Beetle, by G. M. List (pp. 235–238); The Sweet Potato weevil, by E. L. Cockerham (pp. 239–244); The Fruit Flies (Trypetidae), by H. S. Smith (pp. 245–248); The Walnut Husk Fly (*Rhagoletis suavis* subsp. *completa* Cress.), by A. M. Boyce (pp. 249–253); The Mexican Fruit Fly, by P. A. Hoidale (pp. 254, 255); The Cherry Fruit Flies, by D. C. Mote (pp. 256–258); Whiteflies of Citrus, by E. W. Berger (pp. 259–261); The Gipsy, Brown-Tail and Satin Moths, by A. F. Burgess (pp. 262–266); The Pecan Leaf Case-Bearer and Pecan Nut Case-Bearer, by G. F. Moznette (pp. 267–270); The European Corn Borer (*Pyrausta nubilalis* Hubn.), by D. J. Caffrey (pp. 271–274); The Oriental Fruit Moth, by L. A. Stearns (pp. 275–278); and Pink Bollworm, by S. D. Smith (pp. 279–281).

The entomologist in relation to cotton insect problems of today, B. R. Coad (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 667–672, fig. 1*).—A brief general discussion.

Recent experiments with soil animals attacking roots of sugarcane, H. Spencer and C. L. Stracener (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 680–684, pl. 1*).—In work at the Louisiana Experiment Stations under controlled conditions in a sugarcane field, with cane grown in large cylinders, the soil animals *Lepidocyrtus violentus* Fols., *Onychiurus armatus* Tull., and *Symphylella* sp., working together, caused a marked reduction in growth and final weight and a slight reduction in percentage of sucrose. "Sugarcane in cylinders inoculated with the fungus Pythium was affected similarly, and to approximately the same extent. The growth and yield of sugarcane in cylinders inoculated with both Pythium and the soil animals was poorer. Of the three soil animals, *L. violentus* was the most injurious, *O. armatus* next, while very little damage could be attributed to Symphylella. The two springtails were found capable of affecting germination adversely by eating portions of the buds and bud scales."

The Latin square arrangement of experimental plats, F. Z. Hartzell (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 747–753*).—In this contribution from the New York State Experiment Station it is pointed out that "variation in infestation vitiates conclusions drawn from field tests unless the plat technic is able to compensate for such heterogeneity. The Latin square arrangement of test plats proposed by [R. A.] Fisher has a number of advantages over the ordinary method of using strips across the area. The Latin square is applicable to areas in which the variation from plat to plat occurs by approximately constant differences. It does not always compensate for heterogeneity when differences occur by chance or in approximately geometrical series. Careful studies of proposed test areas should be made to determine the type of variation present and no tests made except in those places in which a high degree of accuracy can be secured."

Physical and chemical properties of commercial arsenical insecticides.—II, Magnesium arsenate, F. E. Dearborn (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 758–764*).—This second contribution (E. S. R., 63, p. 847) deals with magnesium arsenate insecticides, which are prepared commercially by treating magnesium hydroxide suspended in water, or a solution of a

magnesium salt, with arsenic acid or an alkali arsenate. "The di or trimagnesium arsenate is formed, depending upon the proportion present of the reacting compounds. The reaction products are then heated in an autoclave to a temperature of 165–175° C. under pressure for several hours in order to reduce the water soluble arsenic content to a low value. The product is then filtered, dried, and ground to a fine powder. There are two grades of this product on the market, and a typical chemical and physical analysis of each is given. They both contain a crystalline material of which certain of the optical properties agree with those of the basic arsenate $Mg_3(AsO_4)_2 \cdot MgO \cdot YH_2O$ mentioned in the patents. A short review of the published entomological tests with this material is included."

The onion thrips on seedling cotton, with a season's record of parthenogenetic development, C. O. EDDY and W. H. CLARKE (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 704–708, pl. 1, fig. 1*).—In observations at the South Carolina Experiment Station it was found that infestations of the onion thrips caused seedling cotton plants to grow slowly and assume a malformed condition. "Buds were rarely blasted. Lateral growth sometimes resulted. Unfolding leaves had holes, marginal erosions, raised thin areas, and a crinkly surface. Using approximate figures, the average unmated female lived 14 days and laid 14 eggs in a period of 8 days. Individuals developed in 14 days, nearly 5 days being spent in the egg, between 2 and 3 in each of the 2 larval instars, 1.5 in the propupa, and 3 in the pupa. In July a generation followed the previous one as closely as 15 days, the period lengthening to 26 days in August."

A note on Stibaropus tabulatus Schiö. (Hem., Pent.), a new pest of tobacco in south India, P. N. K. AYYAR (*Bul. Ent. Research, 21 (1930), No. 1, pp. 29–31*).—This is an account of a pentatomid bug of the subfamily Cydninae, remarkable in having the unusual habit of living underground and attacking the roots of tobacco.

A new method of distributing Empoasca fabae (Harris), F. W. POOS (*Jour. Econ. Ent., 23 (1930), No. 4, p. 770*).—Notes on the hatching of *E. fabae* in Washington, D. C., from eggs deposited in beans shipped from the peninsula of Florida are presented.

Additional notes on Aphis pomi DeG., C. R. CUTRIGHT (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 738–741*).—It was observed at the Ohio Experiment Station that growing terminals are at least four times as attractive to the apple aphid as the nongrowing, and that the aphids located on such produced almost six times as many young.

The influence of resistant apple scions on the susceptibility of nonresistant stocks with relation to woolly aphid attacks, C. L. FLUKE (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 741–743, fig. 1*).—A study of the influence of Northern Spy, long known as an apple variety fairly free from woolly aphid attack, on susceptible stock when used as a top graft or an intermediate scion showed that there was very little, if any, positive influence.

Some methods of trapping plant lice, F. M. HULL (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 715–717, pl. 1, figs. 2*).—In work at the Texas Experiment Station screens made of hardware cloth and coated with tanglefoot proved more satisfactory than those made of cheesecloth and voile. Eight mesh wire cloth was used and the tanglefoot thinned by heating before being applied to the screens. The records kept indicate that there are two periods of the year more dangerous than others to the crop so far as infestation with lice is concerned. Crops planted at periods when there is little wind movement of lice have an advantage over others.

Petroleum oil summer sprays for pine leaf scale control (family Coccidae—order Homoptera), H. H. RICHARDSON (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 753–758*).—Tests were made in the field in the summer of 1928 to determine the toxicity to the white pine scale *Chionaspis pinifoliae* (Fitch) of petroleum oils, including (1) lubricating oil, (2) miscible oil, and (3) three grades of highly refined white oil.

"The tolerance of the various coniferous foliages to these oils was also determined. Little difference was noticed in the toxicity of the oils (when compared at strengths sufficient for control). An oil concentration of 2.5 per cent was sufficient to give commercial control (90–100 per cent). Highly refined white oils (B. 36.6–35.4°, Saybolt viscosity 45–85 sec./100° F.) were the only oils which could be applied (at a concentration sufficient for control) without subsequent foliage injury. The conifers tested varied in their susceptibility to oil spray injury in the following order: (1) White spruce (most susceptible), (2) white pine, (3) red pine and Scotch pine (least susceptible). The bloom normally present on conifers disappears when an oil spray is applied. It reappears within 5–10 weeks, depending on weather conditions and the volatility of the oil applied."

Note on Plebeius acmon Doubleday and Hewitson, R. K. FLETCHER (*Jour. Econ. Ent., 23 (1930), No. 4, p. 770*).—The butterfly *P. acmon* was reared at the Texas Experiment Station from larvae found infesting the pods of *Astragalus triflorus* about 35 miles south of Marfa, Tex. This plant, known by the common name of "garbancillo," is thought by ranchmen to be poisonous to stock.

Results secured on the gipsy moth extermination project in New Jersey, A. F. BURGESS (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 718–720, figs. 2*).—This is an account of eradication work in New Jersey, annual reports on which have been noted (E. S. R., 61, p. 550).

Gipsy moth barrier zone maintenance problem, A. F. BURGESS (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 720–725, fig. 1*).—A brief discussion of control work.

The occurrence of Anticarsia gemmatilis as a soybean pest in Louisiana in 1929, W. E. HINDS (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 711–714, pls. 3*).—In this contribution from the Louisiana Experiment Stations an account is given of the velvetbean caterpillar, a tropical lepidopteran which occurred in injurious numbers for the first time in Louisiana in August, 1929, showing a decided preference for soybean varieties over velvetbean.

"The infestation resulting in defoliation of soybeans appeared earliest in the vicinity of Jeanerette, La., and gradually spread northward to the middle of the State. Brief notes on life history, habits, and natural enemies were secured. Late in August a general development of a fungus disease believed to be *Empusa rileyi* checked the further multiplication of the species in an important degree. Insecticidal control was found possible with calcium arsenate containing 5 per cent of hydrated lime and dusted on the dry foliage. Arsenate of lead was not advisable. Sodium silicofluoride of the light dust type, without hydrated lime, gave good control of the worms with very little foliage burning where applied to dry foliage. Poisoned plants put out new growth, while unpoisoned plants were completely destroyed and seed setting prevented by the worms."

The velvet bean caterpillar as a pest of soy beans in southern Louisiana and Texas, W. A. DOUGLAS (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 684–690*).—The application of a "light" or 80 per cent brand of sodium fluosilicate was found to be very effective in destroying the velvetbean caterpillar, observations on the life history, natural enemies, and control of which are here reported.

Oviposition of the corn earworm moth in relation to nectar flow of some flowering plants, J. W. Nuttycombe (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 725–728, pl. 1*).—Studies conducted by the author at Charlottesville, Va., indicate that food is a strong factor in determining the number of eggs deposited by corn ear worm moths. These moths feed upon the nectar from the blossoms of a great variety of plants, the overlapping flowering periods of which cover the oviposition period of the moths. Nectar flow from these plants, although greatly curtailed by drought, is apparently never so reduced as greatly to affect oviposition. Consequently, search must be made elsewhere for factors causing marked disturbances in the normal seasonal abundance of the eggs.

Relative effects of Bordeaux mixture and of hydrated lime on arsenical sprays in the control of the pecan leaf case-bearer, G. F. Moznette (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 691–699*).—As correctives for arsenical injury to pecan foliage, Bordeaux mixture proved to be effective in preventing injury while hydrated lime used at the same strength as in the fungicide did not. "When acid lead arsenate and Paris green were used separately in combination with Bordeaux mixture and at strengths at which they contained approximately the same quantity of metallic arsenic, the Paris green-Bordeaux mixture was the more effective against the pecan leaf case-bearer (*Acrobasis palliolella* Rag.). Commercial calcium arsenate in combination with Bordeaux mixture, when the arsenical was used at a strength at which it contained more metallic arsenic than did either the acid lead arsenate or the Paris green as used in combination with Bordeaux mixture, gave insecticidal results nearly comparable to those of the Paris green-Bordeaux mixture combination. Commercial calcium arsenate in combination with Bordeaux mixture appeared much more effective in the control of the pecan leaf case-bearer than was acid lead arsenate in combination with Bordeaux mixture, when the same poundage of each arsenical was used. Furthermore, the cost of the calcium arsenate in the Bordeaux mixture was only about one-half that of the acid lead arsenate."

A new moth damaging oil-palm in the Belgian Congo, W. H. T. Tams (*Bul. Ent. Research, 21 (1930), No. 1, pp. 75, 76, pl. 1*).—Under the name *Pimelephila ghesquierei* n. g. and sp. the author describes a new pyralid moth which damages the oil palm (*Elaeis guineensis*) in the Belgian Congo.

Second report on some of the more important insects captured in codling moth trap baits, Yakima, Wash., 1927–28, M. A. Yothers (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 729–735*).—In this second contribution (E. S. R., 62, p. 654) observations on the earliest and latest occurrences and times of maximum numbers of some of the more important of the insects captured, such as the clover hay worm, the oblique-banded leaf roller, the chrysopas, and the noctuids, are recorded.

Two new moths with larvae injurious to coffee in Uganda, W. H. T. Tams (*Bul. Ent. Research, 21 (1930), No. 1, pp. 73–75, pl. 1*).—Under the names *Metadrepana marantica* n. sp. and *Parasa hexamitobalia* n. sp. the author describes two new moths of the families Drepanidae and Limacodidae, respectively, the larvae of which feed on coffee in Uganda.

Moth pests in cocoa and confectionery, W. M. Noyes (*Bul. Ent. Research, 21 (1930), No. 1, pp. 77–121*).—An extended account of moth pests of cocoa and chocolate, of which the Mediterranean flour moth, the cocoa moth (*Ephestia elutella* Hübn.), the fig moth (*E. cautella* Walk.), and the Indian meal moth are the chief pests. Beans are infested before arrival at the factory, this infestation commencing on the plantation and increasing during the various

stages of transit to the factory. The docks, in particular, may be the most important source of infestation, owing to the fact that there fresh consignments may be brought into direct contact with much older consignments already heavily infested. General cleanliness in the factory, heat treatment of beans upon arrival at the factory by subjection to a temperature of from 60 to 65° C. (140 to 159° F.), the use of traps in the factory, and the protection of all finished goods by means of fine-mesh materials are recommended.

A list is given of 37 references to the literature.

The "spitting" habit of lepidopterous larvae, H. J. Pack (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 736–738*).—In this contribution from the Utah Experiment Station the author reports that he has found certain lepidopterous larvae, including the gooseberry fruit worn, peach twig borer, eye-spotted budmoth, and *Recurvaria nanella* Busck, invariably to reject the first mouthfuls of food when entering the host plant. *Hulstea undulatella* Clem., the alfalfa looper, and a species of Loxostege, all of which differ from those above mentioned in being external feeders, did not reject or spit food.

Experiments with Paris green for the destruction of Anopheles-larvae, G. J. Schuurman and A. Schuurman-ten Bokkel Huinink (*Meded. Dienst Volksgezondh. Nederland. Indië, 17 (1928), No. 2, pp. 207–219, pls. 2, fig. 1*).—Studies conducted in the Dutch East Indies here reported included (1) the search for a satisfactory powder occurring in the islands with which to reduce the Paris green to a 1 per cent mixture, and (2) a testing of Stoxal as recommended by Roubaud (E. S. R., 56, p. 258). Red earth, available everywhere in the islands at little cost, proved to be a satisfactory diluent, spreading readily and leaving the larvicide its full activity. Stoxal, a formalin preparation, was found to be far inferior to Paris green as a larvicide. Paristan, a product placed on the market by a Calcutta company, was found ineffective against Anopheles and Culex larvae.

Application of Paris green as an Anopheles-larvicide (second report), C. J. Schuurman and A. Schuurman-ten Bokkel Huinink (*Meded. Dienst Volksgezondh. Nederland. Indië, 18 (1929), No. 1, pp. 143–150, pls. 2*).—The work conducted led to the conclusion that a 1 per cent mixture of Paris green in red earth gives the best results. A 2 per cent mixture is recommended when the wind is unfavorable and variable or when the production of larvae is abnormally large. Used at this rate the Paris green will destroy 100 per cent of the larvae from 4 mm. in length up to adult size, but smaller larvae and the pupae are not impaired. A large number of algae at the surface and submerged do not necessitate an increased dose of the Paris green.

Dusting with the larvicide Paris green, containing 56 per cent As_2O_3, is not dangerous for the persons charged with it provided they turn their back to the wind during the dusting. At the rate recommended it would not make brackish fish-pond water unsuitable drinking water for man or animals. While all Anopheles larvae large enough to consume the particles of Paris green are destroyed, other aquatic animals, such as larvae and pupae of other insects and fishes, namely, *Haplochilus panchax* (Malay: Ikan kepala timah), shrimps (Carididae), and bandeng (*Chanos chanos*) remain unharmed. The arsenic percentage of the fishes is not influenced at all by the dusting. It is not impossible that with another flora a result may be obtained somewhat different from the above as regards the arsenic percentage of water and fish. The safety margin, however, is so large that Paris green probably may be used for any Anopheles breeding place without exception.

The effect of hydrogen-ion concentration on the toxicity of nicotine, pyridine, and methylpyrrolidine to mosquito larvae, C. H. Richardson

and H. H. SHEPARD (*Jour. Agr. Research* [U. S.], *41* (*1930*), *No. 4*, *pp. 337–348*, *figs. 3*).—The authors here report upon the results of investigations conducted on the toxicity of nicotine to the common house mosquito (*Culex pipiens* L.), as studied in aqueous solutions of varying pH values. A few similar experiments were also made with pyridine and methylpyrrolidine.

"Solutions of 0.03 M concentration adjusted to pH values of 2.4, 3.6, 5, and 7 with sulfuric acid and at pH 9.7 (the free base) showed a toxic action that increased with increasing pH value. Solutions adjusted to pH 3.6 and 5 with hydrochloric acid gave similar results to those adjusted with sulfuric acid. Solutions of 0.1 M, 0.03 M, 0.01 M, and 0.001 M concentrations were adjusted to pH 5 with sulfuric acid and compared in toxicity with solutions of the base of the same molar concentrations. At each nicotine concentration the free base is about 5 to 7 times more toxic than is nicotine sulfate solution at pH 5. The addition of inorganic hydroxide (0.05 to 0.001 N) to an aqueous solution of nicotine is without apparent effect upon the toxicity of that solution. Pyridine solutions of 0.03 M and 0.12 M were about twice as toxic as solutions of the same molar concentration titrated to pH 5 and 4.9, respectively, with sulfuric acid. Methylpyrrolidine solution (0.03 M) was about 19 times more toxic than methylpyrrolidine hydrochloride solution of pH 3.

"The speed of toxic action to the larva of *C. pipiens* of nicotine, pyridine, and methylpyrrolidine in aqueous solution is directly related to the concentration of the undissociated molecules. It is believed that toxicity results largely from the penetration of the molecules into the body through the wall of the alimentary tract. Nicotine ions are somewhat toxic but much less so than nicotine molecules. It is also believed that the change in toxicity of a nicotine solution with change in pH results largely from the dissociation of the pyrrolidine nitrogen. Previous writers have explained the greater toxicity of nicotine over nicotine sulfate on the basis of the greater volatility of the former. In this study it is shown that the free base in solution is also much more toxic than nicotine sulfate."

A list is given of 25 references to the literature.

Erax interruptus Macq. as a predator, B. A. OSTERBERGER (*Jour. Econ. Ent.*, *23* (*1930*), *No. 4*, *pp. 709–711*, *pl. 1*).—In observations at the Louisiana Experiment Stations larvae of *E. interruptus*, occurring in the soil in fields of sugarcane and other field crops, were found to feed readily on white grubs. Pupation began the first week in May and lasted until the first week in June, requiring from 20 to 26 days for the transformation to adult.

Notes on Paratheresia claripalpis Van der Wulp, a parasite of Diatraea saccharalis Fabr., H. A. JAYNES (*Jour. Econ. Ent.*, *23* (*1930*), *No. 4*, *pp. 676–680*).—An account is given of observations on the life history of the dexiid parasite *P. claripalpis* made from August, 1928, to September, 1929, in Argentina and Peru, from which countries shipments of the parasite were made to Louisiana. It was found that this parasite could withstand cold storage when in the puparium, and that shipments could be made over long distances.

Studies in apple maggot control in the Hudson Valley, F. G. MUNDINGER (*Jour. Econ. Ent.*, *23* (*1930*), *No. 4*, *pp. 764–769*, *fig. 1*).—The author has found that the timing of poison applications for the apple maggot is best determined by the use of large emergence cages under nearly natural conditions. Arsenate of lead, 2.5 lbs. to 100 gal., applied as the flies are beginning to increase in numbers and a second application about 10 days after the first, gives a large measure of protection. It is well to observe early varieties and protect them first. The maintenance of a poison cover, spray or dust, during the preoviposition period seems to be a very promising safeguard.

A comparative study of dusting by means of airplane and ground machine for the control of the blueberry maggot, F. H. LATHROP and C. R. NICKELS (*U. S. Dept. Agr. Circ. 123 (1930), pp. 15, figs. 3*).—Preliminary experiments conducted in Washington County, Me., during the summer of 1925 and the season of 1926 led to a more extensive study during the summers of 1927 and 1928, here reported. The work during the two latter years showed calcium arsenate applied as a dust to be effective in controlling the blueberry maggot. Large areas of blueberry land in that county have a topography nearly ideal for airplane dusting, but it is difficult to find solid blocks of as much as 100 acres suitable for profitable dusting.

"Under favorable conditions, dusting by airplane was as effective as dusting by ground machine, but under usual conditions of atmosphere and topography the ground machine gave somewhat better results than did the airplane. Dusting hill land presented a difficult problem for the airplane. Heavy fog during the early morning hours greatly reduced the length of time available for satisfactory dusting by airplane, as compared with the time available for dusting with ground machine. It is doubtful if the increased rapidity of the work of the plane compensated for this shortening of the dusting time."

Traps for the Japanese beetle, E. R. VAN LEEUWEN and F. W. METZGER (*U. S. Dept. Agr. Circ. 130 (1930), pp. 16, figs. 6*).—The present bulletin reports upon the new developments in trapping the Japanese beetle as a result of experimental work conducted during the summers of 1928 and 1929 in continuation of that previously noted (E. S. R., 60, p. 65).

It has been found that the use of traps is an effective and inexpensive means of capturing large numbers of Japanese beetles, but they are not recommended to protect fruit, flowers, or foliage from beetle attacks. Nearly 50 types of experimental traps have been tested by the authors in an attempt to improve the efficiency of traps in general, and several improvements have been made in the type previously recommended. It has been found that geraniol, at the rate of 10 gm. with eugenol at the rate of 1 gm. to 100 gm. of bran, molasses, glycerine, and water base form the most attractive bait combination for use in traps at the present time.

"Traps painted green captured more beetles than those of any other color used. Brown and yellow traps were, however, approximately 90 per cent as efficient as the green ones. The use of sticky paper on the cylinders of traps greatly increases their efficacy. Over 9,000,000 beetles were destroyed by the use of 500 traps on a 15-acre tract during the summer of 1929. A description is given of a trap which is satisfactory in every respect. General information is included regarding the preparation of bait and the care and proper location of traps."

Life history and habits of the plum curculio in the Georgia peach belt, O. I. SNAPP (*U. S. Dept. Agr., Tech. Bul. 188 (1930), pp. 91, pls. 10, figs. 7*).—This is a report of an intensive study of the life history of the plum curculio in the Georgia peach belt. Studies were conducted during the seasons of 1921 to 1924, inclusive, at a field laboratory at Fort Valley, within 100 miles of which town there are between 10,000,000 and 12,000,000 bearing and nonbearing fruit trees in commercial orchards.

"The maximum number of eggs deposited by a single female plum curculio was 516. The average number of first-generation eggs deposited per individual per season was 64.64 and the average number of second-generation eggs deposited per individual per season was 40.21. The incubation period of first-generation eggs during the 4 years ranged from 2 to 12 days, with averages ranging from 4.33 to 5.08 days. The period of incubation of second-generation eggs ranged from 2 to 7 days, with averages ranging from 2.94 to 3.18 days.

The time spent in the fruit by first-generation larvae ranged from 21.5 days for those entering in April to 12.4 days for those entering in July. Second-generation larvae reached maturity in 12.7 days during the period of June, July, and August. The average time spent in the soil as larva, pupa, and adult was 34.16 days for the first generation and 30.43 days for the second generation. The average time required for the first generation to complete its entire life cycle was 52.26 days, and the second generation required an average of 47.53 days to pass through its entire life cycle. Weather conditions influence the rate of winter survival and the time of emergence of hibernating curculios.

"The most important parasite of the plum curculio is *Triaspis curculionis* Fitch. The abundance of curculios may be reduced by jarring the trees and destroying the beetles caught, gathering the peach drops and burying them with quicklime, and disking the soil during the pupation period. Acid lead arsenate was found to be the most effective insecticide for the plum curculio."

Notes are also presented (pp. 88–90) on the closely related *Conotrachelus anaglypticus* Say, referred to by Brooks and Cotton as the cambium curculio (E. S. R., 52, p. 157), which has been found to be a pest of the peach of some economic importance in Georgia.

Calcium arsenate tests, 1929, a progress report on small-scale tests comparing boll weevil control with Lucas' green cross calcium arsenate vs. a "standard brand" of calcium arsenate, W. E. HINDS (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 672–676*).—In field work at the Louisiana Experiment Stations two forms of calcium arsenate were tested in various ways. The Lucas Kil-Tone special calcium arsenate showed indications of some advantages in dusting qualities and in adhesion to cotton, in spite of rains, when compared with one of the widely used and generally satisfactory brands. "It appeared to be slightly more efficient in reducing the percentage of squares attacked by the boll weevil in the plats dusted with this material and in the yield of cotton secured from an average of the four treated plats. In cage toxicity tests where weevils were exposed for 24-hour periods on dusted plants, the Lucas material gave an average mortality of 58 per cent for the six successive periods of 24 hours exposure while standard brand calcium arsenate gave an average of 38 per cent. These results were from three series of tests."

Results of spraying and dusting experiments on large blocks of peach trees for the control of the curculio, O. I. SNAPP (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 699–704*).—In a comparison made at Fort Valley, Ga., of the effectiveness of spraying and dusting, lead arsenate applied as a spray was more effective against the plum curculio attacking peaches than the same insecticide applied in a dust mixture. The petal fall spray, applied when from 50 to 75 per cent of the petals had fallen, was found to be an important part of the spray schedule.

A key to the principal families of Coleoptera in the larval stage, A. W. R. ROBERTS (*Bul. Ent. Research, 21 (1930), No. 1, pp. 57–72, figs. 11*).—This key is accompanied by a list of definitions and a bibliography of four pages.

A study of the morphology and biology of Blastophaga psenes (L.) [trans. title], G. GRANDI (*Bol. Lab. Ent. R. Ist. Super. Agr. Bologna, 2 (1929), pp. 1–147, pl. 1, figs. 47*).—A second revision of an extended account, published in 1920,[1] of the morphology and biology of the fig wasp, presented in connection with a bibliography of 416 titles.

The Eriophyidae of New York.—II, The maple mites, H. E. HODGKISS (*New York State Sta. Tech. Bul. 163 (1930), pp. 45, pls. 14, fig. 1*).—This second

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[1] Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 14 (1920), pp. 63–204, figs. 31.

contribution on the Eriophyidae of New York (E. S. R., 18, p. 955) deals especially with the 25 species which subsist on the foliage of maple trees. The most important of the species here considered, from an economic standpoint, are the soft maple pouch gall mite (*Phyllocoptes quadripedes* Shimer) and the fusiform gall mite (*P. aceris-crumena* Riley), which occurs on the leaves of the hard maple. Among other species that have been recognized on this host are two European mites, *P. gymnaspis* Nal. and *Oxypleurites serratus* Nal. Tables are given for the separation of the several genera and species.

The mite Linopodes antennaepes Banks as a pest of cultivated mushrooms, with preliminary tests toward control, O. E. Gahm (*Jour. Econ. Ent., 23 (1930), No. 4, pp. 744–747, pl. 1*).—The mite *L. antennaepes*, hitherto unrecorded as a pest of mushrooms, was first found attacking cultivated mushrooms in Pennsylvania during March, 1929. "The mite was found later in the year causing commercial damage in ranges of mushroom houses at Ashtabula, Ohio, and Naperville, Ill., and in one of the standstone caves at St. Paul, Minn.

"The injury produced by this mite is characterized by a partial destruction of the root system and a decided constriction of the sporophore at the base. Thermal death point experiments show that the mites can not withstand a temperature of 100.4° F. for a half hour exposure in a constant temperature chamber with an accompanying relative humidity of 89 per cent. Control by steaming the surface of the compost heap was practiced with good results."

ANIMAL PRODUCTION

Chemical studies on sex differences of proteins in animals and plants, I, II, T. Tadokoro, M. Abe, and S. Watanabe (*Jour. Faculty Agr., Hokkaido Imp. Univ., 23 (1928), No. 1, pp. 27*).—These studies (E. S. R., 58, p. 566) have been continued.

I. *Sex differences of muscle-fibre.*—In this experiment it was found that the acidity of solutions prepared with muscle fibers of the bull, cock, boar, male rabbit, wild drake, male codfish, and male hatahata (*Arctoscopus japonicus*) was always greater than that of solutions made with corresponding female fibers. While the phosphorus content of muscle fibers was usually about 20 per cent as great as the sulfur content, there was a tendency to find higher sulfur and lower phosphorus content in male muscle fiber than in female muscle fiber. The male muscle fiber contained a predominance of arginine and lysine nitrogen, while in female muscle fibers there was an excess of monoamino and histidine nitrogen.

The development of acidity in neutral salt solutions in the presence of male and female muscle fibers showed a corresponding tendency in the case of oryzenin of common and glutinous rice. The same tendency toward differences in amino acid and sulfur and phosphorus content was found between male and female muscle fibers as in the oryzenin of common and glutinous rice. There was a tendency to find a higher sulfur and a lower phosphorus content in the male muscle fibers and oryzenin of common rice, while the opposite was true of female muscle fibers and oryzenin of glutinous rice.

II. *Sex differences of muscle proteins.*—In this study the ash and phosphorus contents of the female myosin and myogen were always greater than those of the male, which may explain the greater retention of phosphoric acid in the female body. The pH value of the female myosin and myogen was lower than that of the male, while the specific rotary power of male myosin and myogen was greater than that of the female. The combined content of myosin, myogen, serum albumin, and globulin in male muscles was greater than in the

case of female muscles. The free amino nitrogen of the female myosin and myogen was only from 80 to 90 per cent as great as that of the male.

The amount of arginine nitrogen in the female proteins was about 85 per cent and the lysine nitrogen 82 per cent as great as that of the male, while the monoamino nitrogen of the male was about 95 per cent and the histidine nitrogen 65 per cent as great as that of the female. A significant difference in the ratios of the acetyl group to nitrogen was observed between male and female muscles.

Length of gestation period in cattle and swine [trans. title], I. JOHANSSON (*Red. Ultuna Landtbr. Inst.* [*Sweden*], *1928, pp. 41–59, figs. 8; Eng. abs., pp. 57, 58*).—Variations in the length of gestation periods were obtained on 13 herds of purebred Swedish Red and White cattle and from one herd of purebred Large White swine.

The limits of 10,219 gestation periods for the cattle lay within the limits of 262 and 303 days, with a mean of 283.7±0.057 days. The limits of 1,423 gestation periods for the swine were within 105 and 124 days, with a mean of 114.3±0.064 days.

In Swedish cow-testing associations, parturition before a 250-day gestation period is considered an abortion, and on this basis 5.5 per cent of all gestation periods ended in abortion. The number of abortions was about twice as high in summer as in winter and was highest during second gestation periods, and then gradually declined. The first gestation of cattle was usually the shortest, and minor increases in length were observed up to the seventh gestation. Bull calves were carried on the average 1 day longer than heifer calves, and single calves 5.2 days longer than twins. When the latter half of the gestation period fell within the winter months, the calf was carried from 1 to 2 days longer than when the corresponding part of the period fell within the summer months. A slight correlation was found between the second and third gestation periods of the same cows, indicating that similar environmental conditions acting on the same animals in both periods, or the individuality of the cow, may determine the length of gestation.

With sows it was found that indivuality, season of year, and size of litter had little influence on the length of the gestation period. Older sows, however, tended to carry their litters for a slightly longer period than younger sows.

Some digestibility trials on Indian feeding stuffs, IV–VI, P. E. LANDER and P. L. C. DHARMANI (*India Dept. Agr. Mem., Chem. Ser., 10 (1929), Nos. 5, pp. 169–180, pl. 1, fig. 1; 6, pp. 181–192, pl. 1, fig. 1; 10 (1930), No. 7, pp. 193–208, pl. 1*).—This series of studies has been continued (E. S. R., 60, p. 852).

IV. *Some Punjab hays*, II.—The value of hays collected from Rawalpindi, Murree, Amballa, and Lahore as maintenance rations for dry cows was determined, using four 2-year-old heifers. Only the hay from Amballa was capable of maintaining the animals without supplemental feed. This hay, composed mostly of "Anjan grass" (*Pennisetum cenchroides*), was rich in most of the essential ingredients. From 0.5 to 2 lbs of bran per day were required with the other hays to maintain the weight of the animals.

V. *American and Indian cottonseeds.*—The chemical analyses of three American cottonseeds and of Desi cottonseed showed the former to be higher in fat and protein content than the latter. The coefficients of digestibility of the various cottonseeds showed no marked differences, but the digestible starch equivalent and digestible protein per 100 lbs. of seeds of one American variety, and, to a lesser degree, of the other two showed their superior value.

No harmful effects were noted due to feeding cottonseed during the warm season, nor did any of the animals choke on the lint adhering to the cottonseeds.

VI. *Green fodders and their silage.*—In feeding trials with green oats, oat silage, oat hay, green corn, corn silage, and green guar (*Cyamopsis psoralioides*), it was found that all were able to maintain animals in health with a high positive daily nitrogen balance when fed ad libitum. These trials showed that for preserving fodder it was better from the standpoint of both composition and digestibility to convert the green plant into silage rather than into hay. The silage was also more attractive to animals than the hay.

The relative feeding values in terms of starch equivalent, protein, and albuminoid ratio were determined and are presented in table form.

Potatoes in stock feeding, J. K. THOMPSON (*Highland and Agr. Soc. Scot. Trans., 5. ser., 42 (1930), pp. 128–151*).—In this article the author discusses the value of potatoes for the different classes of livestock, the methods of feeding and the precautions that must be taken in using potatoes for feed.

Feeding wheat to livestock (*U. S. Dept. Agr., Misc. Pub. 96 (1930), pp. II+6, fig. 1*).—The value of wheat and barley for livestock, methods of preparing wheat for feeding, and rations containing wheat or barley for dairy and beef cattle, horses, sheep, swine, and poultry are included in this publication, prepared by the Bureaus of Agricultural Economics, Animal Industry, and Dairy Industry.

Production and feeding of silage, L. J. STADLER, M. M. JONES, C. W. TURNER, and P. M. BERNARD (*Missouri Sta. Bul. 287 (1930), pp. 19, figs. 6*).—The value and production of corn and other crops for silage, filling the silo, and feeding silage to livestock are discussed in this publication.

Analyses of commercial feeding stuffs and registrations for 1930, C. S. CATHCART (*New Jersey Stas. Bul. 505 (1930), pp. 93*).—The usual report of the analyses for protein, fat, and fiber of 1,254 samples of commercial feeding stuffs collected for official inspection during 1929 (E. S. R., 62, p. 60). The principal ingredients in the feed mixtures as identified by microscopic examination are listed.

The Texas feed law—revised regulations, F. D. FULLER (*Texas Sta. Circ. 58 (1930), pp. 15*).—The full text of the Texas feed law, effective July 14, 1905, as amended in 1907 and subsequently, and codified in 1925, and regulations revised to June 1, 1930, are printed in this circular.

Handling livestock during drought, E. W. SHEETS and W. JACKSON (*U. S. Dept. Agr. Circ. 140 (1930), pp. 12*).—In this publication the proper management of livestock during a period of severe drought is discussed. The value of emergency crops, farm-grown roughages, and substitutes for corn for the various classes of animals during such periods are explained. Rations which experience has proved to be efficient and economical are suggested.

Cattle feeds of western India, D. L. SAHASRABUDDHE (*Bombay Dept. Agr. Bul. 161 (1930), pp. 23*).—In this publication the methods of feed analysis and the general principles of feeding are discussed. Other sections are devoted to the composition of and general information about oil cakes; information concerning oil seeds, grains, and by-products of grains; and the composition and uses of the various leaves, stems, roots, and silage used for feeding cattle in western India.

Report of experiments comparing heavy root, medium root, and no root rations, W. G. R. PATERSON (*Highland and Agr. Soc. Scot. Trans., 5 ser., 42 (1930), pp. 37–50*).—A series of three studies was conducted at the West of Scotland Agricultural College to determine the most efficient rate of feeding roots to fattening cattle. Three lots of six head each were fed for 12 weeks during three successive years. In each test one group received 80 lbs. of

swedes daily, the second group 40 lbs., and the third group no roots. The remainder of the ration consisted of straw, hay, and concentrates.

The results indicated that the feeding of a heavy ration of roots to fattening cattle was justified by the gains obtained. While a medium allowance of roots did not affect the rate or cost of gains as compared with heavy feeding, it increased the dependence of the feeder upon purchased concentrates. When no roots were fed the cattle gained at a slower rate than where roots were included in the ration, and it is concluded that selling roots on farms where they could be successfully grown is not an economical practice.

It was also found that cattle weighing from 1,000 to 1,100 lbs. of live weight required the equivalent of 9 to 10 gal. of water daily.

Bullock feeding on sugar beet tops and pulp, S. T. JOHNSON (*Jour. Roy. Agr. Soc. England, 90 (1929), pp. 182–194*).—A 3-year study was made at the Norfolk Agricultural Station to determine the value of dried sugar beet pulp in the production of winter beef. Three lots of long yearling steers were fed each year. In 1927 the basal ration supplied all lots consisted of long hay, chaffed hay, barley meal, corn meal, and cottonseed meal, to which was added in the respective lots dried sugar beet pulp, swedes (or mangels), and swedes and dried sugar beet pulp. In 1928 dried pulp, swedes, and beet tops were fed with a basal ration of chaffed hay, tapioca meal, corn gluten feed, and peanut cake, to which was added later rolled barley. In 1929 the basal ration consisted of chaffed barley straw, rolled barley, rolled wheat, and peanut cake with the basal ration of beet pulp, swedes, and beet tops.

The average daily gains in 1927 were 2.6, 2.5, and 2.3 lbs.; in 1928, 2, 2.5, and 1.9 lbs.; and in 1929, 2, 1.6, and 1.6 lbs. per head in the respective lots. In 1927 1 ton of pulp was equal to 8 tons of swedes, in 1928 to 6 tons of swedes or 5 tons of tops, and in 1929 to 7.5 tons of swedes or 6.5 tons of tops.

The results indicate that sugar beet tops and dried sugar beet pulp were satisfactory substitutes for swedes. While beet tops possessed considerable manurial value when plowed under, this study indicates that it is cheaper to purchase their fertilizing equivalent and to use the tops for feed.

Beef grading and stamping service, W. C. DAVIS (*U. S. Dept. Agr. Leaflet 67 (1930), pp. 8, figs. 2*).—The history of commercial beef grading, the results of the experimental grading and stamping service, its establishment as a permanent service, the qualifications of the graders, and the methods of grading and stamping are discussed in this publication. The benefits of this service to stockmen, slaughterers, wholesalers and brokers, retailers, hotels, restaurants, and dining cars, and to housekeepers are explained.

Corn, barley and grain sorghums for fattening lambs, A. E. DARLOW (*Oklahoma Sta. Bul. 196 (1930), pp. 8*).—The results of four feeding experiments with lambs are reported in this publication.

The first test to compare grain on pasture with pasture alone and finishing on grain and to compare darso, corn, kafir, and barley was conducted with 5 lots of 25 lambs each, averaging approximately 64 lbs. per head. All lots were on pasture alone for 50 days, except lot 5, which was fed corn twice a day in addition to the pasture. After the pasture period all lots were fed alfalfa hay, and in addition lots 1 and 5 received corn, lot 2 barley, lot 3 kafir, and lot 4 darso. This phase of the test lasted 71 days. The average gains per head in the entire feeding period were 24.7, 23, 24.12, 24.27, and 33.9 lbs. in the respective lots. Lot 5 made the cheapest gains of all the lots and lot 2 the most expensive. Lot 3 required less grain and hay per 100 lbs. of gain than lot 1, which in turn required less grain and hay than lot 2. Lot 4 required 12 per cent more hay and 10 per cent more grain per unit of gain than lot 3.

In the second test 5 lots of 30 lambs each, averaging approximately 55 lbs. per head, were fed in dry lot for 63 days. Lots 1, 2, 3, and 4 received alfalfa hay and lot 5 cowpea hay, while corn, kafir, darso, barley, and corn, all ground, were fed in the respective lots. The average gains per head were 30, 31.23, 30.27, 28.9, and 28.1 lbs. in the respective lots. Lot 2 required 5 per cent less hay and 5.2 per cent less grain, lot 3 2 per cent less hay and 1.5 per cent less grain, and lot 4 slightly less hay and grain to produce 100 lbs. of gain than lot 1. In lot 5 the lambs required 6 per cent more hay and about 6 per cent more grain to produce a unit of gain than the lambs in lot 1.

Five lots of 21 lambs each, averaging approximately 63 lbs. per head, were fed for 60 days in the third test. The first four lots received alfalfa hay and lot 5 cowpea hay, and in addition the respective lots received barley, darso, kafir, corn, and corn. The average gains per lamb were 16.9, 18, 19.2, 16.6, and 17.4 lbs. in the respective lots. In this study barley proved to be equal to darso and slightly better than corn in feed required per unit of gain, but because of the higher cost of barley the gains were not as economical. Kafir was more economical and efficient than corn, and darso was slightly better than corn on the basis of feed required per unit of gain. Cowpea hay was slightly more efficient and economical than alfalfa hay.

In the last test five lots of 24 lambs each, averaging approximately 57 lbs. per head, were fed for 70 days. In this test all lots received alfalfa hay, and in addition the respective lots received corn, whole threshed darso, ground threshed darso, darso heads ground, and darso heads. The average gains per head were 28.4, 28, 28.7, 26.2, and 26.3 lbs. in the respective lots. Lot 1 made the cheapest gains and lot 4, due to the cost of grinding the heads, the most expensive. The gains and feed requirements in all the lots in this test were very satisfactory.

The influence of various protein concentrates on egg production, H. L. KEMPSTER (*Missouri Sta. Bul. 288 (1930), pp. 20*).—Concluding this study (*E. S. R., 63, p. 765*), the protein supplements dried buttermilk, meat scrap, tankage, and fish meal ranked in the order named with reference to their value for egg production. In addition to the other feeds in the ration, the average hen consumed 8.1 lbs. of dried buttermilk, 5 lbs. of meat scrap, 4.6 lbs. of tankage, and 4 lbs. of fish meal per year.

The extra eggs produced by hens fed dried buttermilk would not pay for the increased cost of the ration as compared with a ration containing meat scrap. Cottonseed meal supplemented with bone meal or rock sulphate and salt was a satisfactory supplement from the standpoint of egg production, but the eggs produced on a ration containing this feed did not have satisfactory keeping qualities. Soybean meal properly supplemented with minerals was found to be an excellent supplement, but ground soybeans even when supplemented with minerals proved to be inadequate.

The effect of vitamin D supplements on laying hens, J. H. MARTIN, S. E. ERIKSON, and W. M. INSKO, JR. (*Kentucky Sta. Bul. 304 (1930), pp. 187–218, figs. 8*).—This study was planned to test the effectiveness of sunshine, cod-liver oil, and ultra-violet light for egg production, amount of eggshell, and hatchability of eggs. During the first year 6 pens of 15 Barred Plymouth Rock and 15 White Leghorn pullets each and during the second year 6 pens of 19 White Leghorn and 12 Barred Plymouth Rock yearling hens were used. Each experimental period extended from November 1 to May 31. The ash content of the bone and the phosphorus content of the blood of the White Leghorn hens were determined at the end of the experiment.

All the pens, except pen 6, received the same all-mash ration, and in pen 6 the ration was the same except that most of the corn was fed as grain in the litter. Pen 1 received no supplement and all its sunlight came through ordinary glass. Pen 2 was irradiated with a quartz mercury vapor arc lamp for 30 minutes daily at a distance of 5 ft. Pen 3 received 2 per cent of cod-liver oil. Pen 4 had a wire-screened porch where they received unfiltered sunlight, and pens 5 and 6 were on bluegrass range. Pens 1, 2, and 3 were confined to a house with a glass porch.

The egg production of both pullets and hens in pen 1 was low. Irradiation or bluegrass range increased the egg production of pullets, while irradiation, sunshine, cod-liver oil, and bluegrass range each increased egg production in yearling hens. The egg production of birds on bluegrass range was the largest in all cases except the winter production period of the Plymouth Rock pullets.

The absence of vitamin D supplement markedly decreased the percentage of eggshell (E. S. R., 62, p. 256), while sunshine, irradiation, or cod-liver oil produced eggs with strong, thick shells. A high percentage of hatchability was obtained in the lots on bluegrass range or receiving sunshine. All the supplements, however, increased the hatchability when compared to that obtained in pen 1 of either pullets or hens.

The analyses of the humeri and blood of the White Leghorn hens producing the smallest and the largest number of eggs in each pen are presented in tabular form.

Further observations on the relation of the preen gland of birds to rickets, H. C. Hou (*Chinese Jour. Physiol., 4 (1930), No. 1, pp. 79–92, pl. 1, fig. 1*).—Continuing these studies (E. S. R., 61, p. 864), feathers, skin, subcutaneous fat, and muscles taken from normal and rachitic fowls were added to the basal diet of white rats that had been on a rachitic diet for 4 weeks. The severity of rickets was determined at the beginning of the test by means of X-ray photographs, and after 4 weeks of experimental feeding other photographs were taken.

It was found that the feathers, skin, fat, and muscle of the normal fowl were antirachitic, but that when birds were made rachitic by the removal of the preen gland early in life and maintained on a ration low in vitamin D, the feathers, fat, and muscle were not antirachitic, and the skin only slightly so. The skin and fat of adult fowls from which the preen gland had been removed and which were kept in the dark on a ration low in vitamin D for 4 months were antirachitic, but the muscles were not. It was evident that ergosterol was present in the feathers and skin of the normal fowl, but absent in the feathers of fowls from which the preen gland had been removed when young. The nonsaponifiable fat-soluble fraction of the skin and feathers of the normal fowl was also antirachitic. While the antirachitic factor was stored in the skin, fat, and muscle, the skin was the last place to be depleted when the bird was deprived of the vitamin.

Effect of bodily injury on egg laying in fowls, M. Steggerda (*Poultry Sci., (1929–30), No. 2, pp. 79–91*).—Continuing the studies of the effect of body injury on egg production (E. S. R., 55, p. 868), the author selected three lots of 24 Rhode Island Red pullets each for this experiment. One lot was used as a check, while in the second lot the membrane surrounding the ovary was removed and in the third lot 10 cc. of blood was removed from the wing of each bird every 2 weeks for 8 weeks. The body cavity of each bird in the control lot was opened in a manner similar to that in lot 2 in order to check the influence of the wound. Total egg production was reported from October to May,

No significant change in total egg production was noted that could be attributed to either of the methods of bodily injury. There was a greater variation in the egg production in lot 2 than in the control lot. In some cases the operation apparently stimulated egg production. Mortality in the respective lots was 7, 4, and 1 birds.

Construction and packing of an egg case, G. H. Powers (*U. S. Dept. Agr. Leaflet 64 (1930), pp. 8, figs. 9*).—The method of constructing an egg case, with a list of materials required and the approximate cost, is discussed. Packing materials and methods of packing are described.

Practical poultry management, J. E. Rice and H. E. Botsford (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2. ed., rev., pp. XVII+540, pl. 1, figs. 319*).—An extensively revised edition of this treatise, previously noted (E. S. R., 54, p. 863).

Wampler's practical turkey methods, C. W. Wampler (*Harrisonburg, Va.: [Author], 1929, pp. [61], figs. [32]*).—Information, based on actual experience and careful observation, for the successful rearing of turkeys is contained in this treatise.

Introduction to the raising of mink, E. Smith (*Anleitung zur Aufzucht des Nerzes. Dessau: R. Böhlert, [1929], pp. 119, figs. 26*).—This is a practical handbook on the raising of mink, the nature and treatment of their diseases, etc.

Fur, M. Bachrach (*New York: Prentice-Hall, 1930, pp. XIV+677, figs. [182]*).—This treatise, divided into three parts, dealing with the geography of the fur world, the physical properties of peltries, and marketing, was designed to furnish information and data concerning the various branches of the fur industry. The characteristics, natural history, merchandising details, and classification of pelts of all fur-producing animals are outlined.

DAIRY FARMING—DAIRYING

Grading up the dairy cow by the use of pure-bred sires, W. W. Baird and S. A. Hilton (*Canada Dept. Agr. Bul. 126, n. ser. (1930), pp. 24, figs. 29*).—The results of 16 years of breeding work at the Dominion Experimental Farm, Nappan, N. S., indicate that a profitable high-grade herd of dairy cows may be built up from a common grade herd of inferior breeding by the use of carefully selected purebred sires (Holstein and Ayrshire). It was found economical to use proven sires and to weed out unprofitable cows. Breeding not only improved the type and color but made animals economical in the use of feed. The purebred sires used transmitted to their offspring their breed type, color, and other characteristics.

The reliability of bi-monthly tests, W. Gifford (*Jour. Dairy Sci., 13 (1930), No. 2, pp. 81–90, figs. 5*).—In an effort to determine the reliability of the bimonthly test, 100 or more Advanced Registry records for Holstein and Guernsey cows tested by the 2-day monthly plan test were studied at the Missouri Experiment Station. From these records the yearly records were estimated by applying the bimonthly test plan, using alternate tests. Records obtained for the first, third, fifth, seventh, ninth, and eleventh months were called the "odd month records," and the others the "even month records." The records of the cows were divided according to fat production.

When all of the data were combined there was a mean of -4.9 ± 0.346 lbs. of fat for the deviations of the records estimated by the odd month test and $+2.499\pm0.375$ lbs. of fat for those estimated by the even month test. These results indicate that when the same degree of accuracy and honesty is used the records obtained with the bimonthly tests are as satisfactory as those obtained with the monthly test.

The effect of some oil cakes on milk secretion, N. S. AYYANGAR, C. K. RASUL, S. K. SINGH, D. B. KOLHE, and L. SIKKA (*Jour. Cent. Bur. Anim. Husb. and Dairying, India, 3 (1929), No. 3, pp. 77–91*).—Experiments using the single reversal method were undertaken to determine the value of oil cakes for milk production. In the first study linseed cake, country pressed coconut cake, and expeller coconut cake were compared, while in the second test linseed cake, peanut cake, and cottonseed meal were compared. In addition to the oil cake, cows received sorghum silage, ragi straw, and a grain mixture.

In the first study linseed cake produced a slightly larger volume of milk than the coconut cakes, but the fat content was much higher in the milk produced on the latter feeds. Somewhat more milk with a higher protein content was obtained by the use of expeller coconut cake, while the country pressed coconut cake produced milk slightly higher in fat content.

The second test showed that peanut cake and cottonseed meal produced equal amounts of milk, and more than the amount produced by linseed cake. The milk produced on the ration containing cottonseed meal was higher in fat and nitrogen content than that produced on the other rations.

In addition to the above results observations are included on the feed consumption of the cattle.

Studies concerning the handling of milk (third edition), compiled by S. WILLIAMS ET AL. (*[Gt. Brit.] Min. Agr. and Fisheries, Research Monog. 1, [rev.], 1929, pp. 91, pls. 4, figs. 9*).—A rewritten edition of this monograph, previously noted (E. S. R., 52, p. 377), divided into the following sections: Essentials of clean milk production, milking machines, methods adopted to encourage the production and consumption of clean milk, evidence of progress, the influence of the bacteriological content of milk upon its keeping quality, faults in milk and milk products, the properties of raw and heated milk, and bovine tuberculosis.

The bacterial flora of aseptically drawn milk, W. DORNER (*New York State Sta. Tech. Bul. 165 (1930), pp. 39*).—A comparison was made of two methods of determining the bacterial count of aseptically drawn milk. Samples of milk were drawn from each teat of 132 cows belonging to 6 herds located in the vicinity of Geneva, N. Y., after 1 or 2 qt. had been drawn from each quarter of the udder. In all, 993 samples were examined. The samples were drawn into small sterile test tubes, and cultures were made from 1 to 4 hours after milking. One set of samples was poured on standard plain agar and incubated at 37° C. for 48 hours. The second set was examined according to the Burri quantitative smear culture technic (E. S. R., 60, p. 662), in which a calibrated platinum loop holding 1 mg. was used as a measure, and then smeared on the dried surface of an agar slant. These cultures were then incubated at 30° for 3 days.

A great variation was found in the calculated average bacterial counts from each herd. On the Burri slants the lowest count obtained was 3,965 per cubic centimeter, the highest 9,635, and the average 7,475 per cubic centimeter. The corresponding counts obtained on the standard agar plates were 530, 4,390, and 2,775 per cubic centimeter. The distribution of samples according to the proportion of various groups of bacteria in the total counts are shown in table form. It appeared that a small number of samples containing relatively high numbers of bacteria were usually responsible for the high counts obtained in aseptically drawn milk.

On Burri slants organisms similar to *Bacterium lipolyticum* made up 49.9 per cent of the organism, streptococci 32.2 per cent, and micrococci 18.4 per cent, while on the standard agar plates rods identical with *B. lipolyticum* made up

only 10.4 per cent of the bacterial count, micrococci 47 per cent, and streptococci 42.3 per cent. Rods were found on only 8.8 per cent of the samples. This failure of the commonest organisms to grow on standard plates indicates that this medium and technic are not entirely suitable for controlling the quality of high-grade raw milk. On the other hand, the Burri technic, in addition to being more rapid and convenient, was especially well adapted to low-count milk.

Samples containing streptococci had an average bacterial count of 14,350 per cubic centimeter on slants and 9,720 per cubic centimeter on standard agar; samples containing rods, 9,700 and 3,190; and samples containing micrococci, 5,520 and 3,600, respectively.

Later work with the Burri agar slant technic was done at Liebefeld, Switzerland, examining 944 samples from 241 cows in 22 herds. In this work the calculated average herd count was 3,099 per cubic centimeter. In these counts micrococci were most abundant, and the rods of the *B. lipolyticum* type the least in numbers. However, the samples containing the streptococci gave the highest average counts and those containing the rods the lowest average counts. These differences indicate the necessity for further work in order to determine the normal bacterial count of aseptically drawn milk.

The speed of germicidal action of chlorine compounds upon bacteria commonly occurring in milk, C. K. Johns (*Sci. Agr., 10 (1930), No. 9, pp. 553–563*).—At the Central Experimental Farm, Ottawa, Ont., a study was made to determine the speed with which B-K, Diversol, Santamine, Sterilac, and a homemade concentrated solution of sodium hypochlorite destroyed mixed organisms from milk cans (*Escherichia coli, Aerobacter aerogenes, Subtilis lactis*, and spore forms of *Bacillus subtilis*).

The liquid hypochlorites, B-K, Diversol, and the homemade solution, were very effective against all nonspore-forming organisms. Diversol was effective against the gas-producing organisms, somewhat slower against the mixed organisms, and quite slow against *S. lactis*. Both of the chloramine-T products, Santamine and Sterilac, acted too slowly to be considered suitable as sterilizing rinses. Against the spores of *B. subtilis* none of the products had any noticeable effect during a 2-minute exposure. Apparently the retarded action of Diversol against *S. lactis* was due to the higher hydroxyl-ion concentration of solutions made from this product.

The percentage loss of available chlorine from the concentrated products over a 3-months period was least with chloramine-T, followed in order by the homemade solution, B-K, and Diversol.

Feed flavor or stable odor in milk caused by an atypical strain of Aerobacter oxytocum, W. Sadler and M. L. Irwin (*Canad. Jour. Research, 3 (1930), No. 3, pp. 200–204*).—A study was made at the University of British Columbia of an organism of the Escherichia-Aerobacter group which produced an alleged feed flavor or stable odor in milk. Its cultural characteristics have classified it tentatively as an atypical strain of *A. oxytocum*, and it is suggested that the organism may be defined as a new species when other characteristically identical strains have been identified.

The effect of lactose on the survival of Escherichia coli when heated to 145° F. for thirty minutes, E. A. Beavens (*Jour. Dairy Sci., 13 (1930), No. 2, pp. 91–93*).—In studies at the Maryland Experiment Station the ability of *E. coli* to survive pasteurization when grown in increasing concentrations of lactose indicated the possibility of a similar protective action in milk. There was an apparent relation between the ability to survive and the concentration of lactose up to and including 20 per cent.

The Escherichia-Aerobacter group as an index to proper pasteurization, E. A. Beavens (*Jour. Dairy Sci., 13 (1930), No. 2, pp. 94–101, fig. 1*).—An examination of 100 samples of milk at the Maryland Experiment Station before and after pasteurizing at the temperatures used in commercial practice showed that in 32 per cent of the cases Escherichia-Aerobacter organisms were able to survive. The death point of strains of *E. coli* was raised by acclimatization from 144° F. for 30 minutes to 148° for a similar period. Since the latter temperature was above the ordinary pasteurizing temperature, the survival of some organisms was expected. These results indicate that the coli test is not a true index of proper pasteurization.

Pasteurization of milk without cooling in India, C. E. Macguckin (*Jour. Cent. Bur. Anim. Husb. and Dairying, India, 3 (1929), No. 3, pp. 67–75, pls. 2*).—In this article the author describes the operation of and the success that has been encountered in eight military dairies in northern India in pasteurizing milk by the holding method without subsequent cooling.

Is all milk equally suitable as a medium for the preparation of starters? C. D. Kelly (*Sci. Agr., 10 (1930), No. 5, pp. 328–332*).—In a study at the University of British Columbia, several commercial starter cultures developed a flat, yeasty flavor when grown in certified milk from one herd but had a clean acid starter flavor when grown in unpasteurized milk having a bacterial count somewhat higher than the certified milk produced in another herd. Two cultures isolated from the certified milk culture produced the same flat, yeasty flavor when grown in the certified milk, but after a few transfers in the unpasteurized milk produced a clean acid starter flavor. These two strains, which appeared identical, were considered to be variants of *Streptococcus cremoris*.

Standardization of milk with skimmilk powder for the manufacture of Cheddar cheese, H. C. Hansen and D. R. Theophilus (*Idaho Sta. Bul. 174 (1930), pp. 16*).—Continuing this study (E. S. R., 63, p. 569), a batch of milk was divided into four parts, one of which was used as a check, and in the other batches skim milk powder was added in ratios of fat to solids-not-fat of 1 : 2.6, 1 : 2.8, and 1 : 3, respectively. Cheese meeting the legal requirements for fat in the dry matter was produced from the milk standardized to ratios of 1 : 2.6 and 1 : 2.8, but when the ratio of 1 : 3 was used a cheese often exceeding the standard for moisture and slightly below the minimum for fat resulted.

Skim milk powder had no measurable effect upon the flavor, body, and texture or total score of the cheese. As the amount of skim milk powder used increased, the loss of fat in the whey decreased. Solids-not-fat added as skim milk powder were just as efficient as the solids-not-fat of normal milk. The increased yield of cheese from the use of standardized milk was due to the efficiency of the solids-not-fat of the skim milk powder, the higher moisture content of the cheese, and the decreased fat loss in the whey.

The skim milk powder was added to the milk either as a 20 per cent solution of cold water or by placing the powder in a metal strainer and pouring milk at from 50 to 60° F. over it. When cheese was valued at 20 cts. per pound, the average return per pound of skim milk powder used was 16.5 cts., and each increase of 1 ct. per pound in the value of cheese increased the value of a pound of skim milk powder approximately 1 ct. High-test milk standardized with skim milk powder produced a cheaper cheese of the same quality and composition as low-test milk.

Butter and cheese, C. W. Walker-Tisdale and J. Jones (*London: Isaac Pitman & Sons, 1929, 2. ed., rev., pp. IX+146, pl. 1, figs. 38*).—This is the second edition of this treatise, previously noted (E. S. R., 46, p. 275).

Moulds in unsalted butter, G. F. V. Morgan (*New Zeal. Dept. Agr. Bul. 149 (1930), pp. 19, figs. 14*).—In this publication the types of molds commonly found in the unsalted export butter of New Zealand are described as to spore formation, mycelial growth and color production, thermal death point, resistance to brine solutions and disinfectants, biochemical features and effect on dairy produce, and behavior under cold storage conditions. General observations on butter molds and precautions against mold contamination are also included.

Eighteenth annual report of the International Association of Dairy and Milk Inspectors, compiled by P. B. Brooks (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 18 (1929), pp. 308, pls. 4, figs. 7*).—The usual report of the annual meeting (E. S. R., 60, p. 569) held at Memphis, Tenn., October 7–9, 1929, includes the following papers:

Fundamentals of Dairy Inspection, by A. D. Burke (pp. 54–58); Report of Committee on Score Cards and the Score Card System of Rating Dairies and Dairy Products, by C. S. Leete (pp. 58–62); Chicago's Program for Securing a Satisfactory Quality of Raw Milk for Pasteurization, by P. F. Krueger (pp. 63–68); Report of Committee on Dairy Farm Methods, by T. J. Strauch (pp. 69–71); Report of Committee on Dairy and Milk Plant Equipment, by G. W. Putnam (pp. 72–77); Milk Plant Design and Equipment, or the Four Square Industry, by G. E. Matter (pp. 77–93); The Sediment Test for Visible Dirt in Milk—Its History, by F. L. Mickle (pp. 93–108); Report of Committee on Milk Plant Practice, by H. A. Harding (pp. 108–113); Developing Effective Milk Supervision in a Small Oregon Municipality, by J. E. Blinkhorn (pp. 114–121); Report of Committee on Methods of Bacterial Analysis of Milk and Milk Products, by G. E. Bolling (pp. 121–125); Report of Committee on Educational Aspects of Dairy and Milk Inspection, by J. D. Brew (pp. 125–129); The Effect of Holding Milk at Low Temperatures on Bacterial Plate Count, by R. R. Palmer and E. T. McCutcheon (pp. 130–135); Report of Committee on Food Value of Milk and Milk Products, by I. V. Hiscock (pp. 135–139); Report of Committee on Serving Milk in Schools, Factories, and Office Buildings, by M. O. Maughan (pp. 139–147); The Pitfalls Connected with Dairy and Milk Inspection, by W. G. Hollingworth (pp. 147–153); "Safety First" in Milk Sanitation, by P. B. Brooks (pp. 153–161); Report of Committee on Dry Milk, by H. N. Parker (pp. 161–180); The First Spray Dried Milk, by R. M. Washburn (pp. 180–186); Possibilities of Certified Milk in Memphis, by G. J. Levy (pp. 187–193); Progress in the Control of the Production of Certified Milk, by C. I. Corbin (pp. 193–196); Laboratory Control of Certified Milk at the Source, by J. G. Hardenbergh (pp. 196–205); Report of Committee on Bovine Diseases: Their Relation to the Milk Supply and to the Public Health, by A. R. B. Richmond (pp. 205–217); San Francisco's Milk Supply and Its Problems, by A. F. Eagle (pp. 218–226); Proper Application of Direct Ammonia Refrigeration to Milk-Cooling Equipment, by W. L. Hutton (pp. 227–235); Import Milk Control, by H. B. Switzer (pp. 236–241); The Legal Phases of Milk Control, by J. A. Tobey (pp. 242–251); Report of Committee on Sanitary Control of Ice Cream, by R. E. Irwin (pp. 251–259); Report of Committee on Milk Ordinances, by W. B. Palmer (p 260); Using the Direct Count to Improve Philadelphia's Milk Supply, by F. R. Ealy (pp. 260–270); The Use of the Methylene Blue Test in Alabama as a Basis for the Classification of Milk Supplies for Manufacturing Purposes, by J. W. Garrett and F. H. Downs, Jr. (pp. 271–278); Local Milk Control, by L. M. Graves (pp. 278–285); Coordinating Municipal Meat and Dairy Inspection in Alabama Communities, by H. J. Thrasher (pp. 286–289); Report of Committee on Communicable Diseases Affecting Man, by H. N. Parker (pp. 289–300); and The Relation of Udder Infection to Human Health, by F. D. Holford (pp. 301–308).

The Pennsylvania Association of Dairy and Milk Inspectors sixth annual report, 1930, compiled by G. C. MORRIS (*Penn. Assoc. Dairy and Milk Insp. Ann. Rpt., 6 (1930), pp. 1–168, pls. 19, figs. 6*).—This report of the association meeting (E. S. R., 62, p. 554) contains the following papers: Presidential Address, by H. B. Mitchell (pp. 27, 28); Activities of Bureau of Foods and Chemistry, by J. W. Kellogg (pp. 29–34); Sanitary Regulations for Ice Cream, by F. Rasmussen (pp. 35–39); The Production of Raw Milk for Sale Direct to the Consumer, by C. N. Gratzinger (pp. 40–42); Building the Model Dairy Barn, by E. R. Scholz (pp. 43–48); Legal Phases of Milk Control, by J. A. Tobey (pp. 49–55); Cleansing of Milk Bottles, by P. E. Lefevre (pp. 56–63); Recent Improvements in Dairy Equipment, by G. W. Putman (pp. 64–72); Milk from the Standpoint of the Consumer, by C. P. Stahr (pp. 73–75); Proper Application of Direct Ammonia Refrigeration to Milk Cooling Equipment, by J. Lambert (pp. 76–82); Our Present Knowledge of the Nutritional Needs of the Body, by E. V. McCollum (pp. 83–87); Report of Committee on Communicable Diseases Transmitted Through Milk, by J. F. Shigley et al. (pp. 88–91); A General Survey of Pennsylvania's Bovine Tuberculosis Eradication Work, by C. P. Bishop (pp. 92–95); Bottle Caps as a Source of Contamination of Milk, by J. W. Rice (pp. 96–107); Undulant Fever, by F. E. Coughlin (pp. 108–111); Bang Disease, by M. F. Barnes (pp. 112–122); Fly Enemies of the Dairyman, by R. Matheson, abstracted by D. A. McCarthy (pp. 123–126); Construction of Milk Houses, by J. M. Horner (pp. 127–133); Dairy Farm Inspections and Score Cards, by C. I. Cohee (pp. 134–139); Field Work during 1929—Bureau of Milk Control—Pennsylvania Department of Health, by H. E. Shroat (pp. 140–145); The Committee on Hygiene and Dairy Methods, by C. G. Gifford et al. (pp. 146–150); and Recording Thermometers, by R. E. Irwin (pp. 151–163).

VETERINARY MEDICINE

Observations regarding the etiology of actinomycosis in cattle and swine, G. O. DAVIES and H. L. TORRANCE (*Jour. Compar. Path. and Ther., 43 (1930), No. 3, pp. 216–233, figs. 3*).—The authors report that actinobacillosis is a common disease of Irish cattle. "Although the tongue is the commonest seat of disease, the hard palate and cheeks are often affected, and not infrequently the abdominal and thoracic organs and serous membranes. Clinical actinomycosis of the soft tissues, such as tongue, lymphatic glands, and internal organs, when unaccompanied by bone lesions is caused by *Actinobacillus lignièresi*. The *Streptothrix actinomyces* has been isolated from a case of actinomycosis in the udder of a sow. Cattle presenting extensive lesions of the internal organs on post-mortem examination appeared perfectly healthy immediately prior to slaughter. Many of them were good fat bullocks. In certain cases it is impossible to distinguish actinobacillosis from tuberculosis without a microscopical examination. A definite diagnosis has a practical bearing on meat inspection. The channel of infection would appear to be through a wound in the skin or a mucous membrane."

The agglutination test is considered a valuable diagnostic method for the identification of the actinobacillus.

Experimental transmission of East Coast fever by inoculation with blood: Differentiation of Theileria parva and T. annulata [trans. title], M. CARPANO (*Ann. Parasitol. Humaine et Compar., 8 (1930), No. 1, pp. 8–16, figs. 2*).—An account of the transmission of Theileria of cattle, first successfully accomplished by the author with *T. parva* in 1912 (E. S. R., 28, p. 478). It is

pointed out that *T. parva* and *T. annulata* differ not only in their morphology but also in their geographical distribution.

The tenacity of the virus of foot-and-mouth disease under field conditions, R. Jackson (*Jour. Compar. Path. and Ther., 43 (1930), No. 2, pp. 89–94*).—Records kept of 42 cases show the average number of days which elapsed before reappearance of the disease to have been 26 days after restocking, 90 days after slaughter, and 74 days after disinfection of the premises. At present the normal practice is to allow animals to be brought on to infected farms 6 weeks after disinfection has been completed, or alternatively 8 weeks after slaughter of the diseased animals, whichever period is the shorter.

The results obtained in Great Britain in the disinfection of foot-and-mouth disease infected places over a long period are considered to justify the recommendation that disinfectants of the coal-tar type, essentially bactericidal agents, are eminently suitable for use against the virus of foot-and-mouth disease, and can be recommended for general use in the disinfection of vehicles, railway trucks, ships, lairs, and railway stations.

Bacteriostatic action of dyes on the organisms of undulant fever, M. S. Marshall and D. Jared (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 6, pp. 525–527*).—The study here reported attempts to throw some light on the discrepancies in so far as the bacteriostatic effect of dyes is concerned. The technic consisted of making appropriate dye concentrations in melted liver hormone agar from which plates were poured and cultures streaked on a sector from a broth suspension of an agar slant culture to insure a degree of uniformity in inoculum. The results were most clearly observed after from 72 to 96 hours of incubation at 37° C. The cultures used were obtained from Tunis, Austria, Italy, Denmark, Germany, and from the western part of the United States, and represented a variety of animal and human sources.

A note on subcutaneous tuberculous lesions, R. Graham, F. Thorp, Jr., and W. A. James (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 1, pp. 97–103, figs. 6*).—The authors report upon two cases, in one of which the subcutaneous gross lesions resembled tuberculosis, while stained smears showed acid-fast rods indistinguishable from *Mycobacterium tuberculosis*. The invasive properties of the virus in vivo could not be demonstrated by injecting rabbits and guinea pigs subcutaneously, but their antigenic properties were suggested following subcutaneous injection of healthy chickens. In the other, before and after the surgical removal of the lesions, no lesions of tuberculosis were induced by inoculating chickens, but one fowl became sensitized to avian tuberculin 90 days following subcutaneous injection of the pus from the nodules.

Contagious abortion of cattle, D. S. Buchanan and C. B. Cain (*Mississippi Sta. Circ. 90 (1930), pp. 4*).—A brief practical account.

Prevention and eradication of infectious abortion in cattle, J. W. Connaway (*Missouri Sta. Bul. 290 (1930), pp. 21*).—This is a practical account prepared with a view to giving cattle breeders, herdsmen, and veterinary practitioners the fundamental facts that are now known relating to the nature of infectious abortion in cattle, and to show how these facts may be used to prevent and eradicate the disease.

The results of the field agglutination test for Bang disease, R. Graham and F. Thorp, Jr. (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 169–173, figs. 4*).—Parallel field and rapid agglutinations for Brucella agglutinins on the same bovine blood samples suggest that the field test may be efficiently employed by careful practitioners with a relatively high degree of efficiency. It is concluded that special precautions must be employed if the results are to compare favorably with the rapid test.

An unusual strain of Brucella causing abortion of cattle in Palestine, S. J. Gilbert (*Jour. Compar. Path. and Ther., 43 (1930), No. 2, pp. 118–124*).—The study here reported indicates that a strain of Brucella of low virulence as far as the lower animals are concerned is prevalent in Palestine. It is capable of causing abortion of cattle, but has not yet given rise to severe outbreaks such as occur as a result of infection with typical European strains. The strain under consideration is considered to occupy a somewhat intermediate position between *B. melitensis* and *B. abortus*.

Studies of bovine mastitis.—III, The diagnosis of streptococcus mastitis, F. C. Minett, A. W. Stableforth, and S. J. Edwards (*Jour. Compar. Path. and Ther., 43 (1930), No. 3, pp. 163–187, figs. 2*).—In this third part of the work previously noted (E. S. R., 63, p. 372), dealing with the diagnosis of streptococcus mastitis, the authors compare four methods that have been put forward for the diagnosis of occult forms of chronic streptococcus mastitis.

The cultural examination of centifuged milk sediments by deep plating in blood agar was found to be the most reliable. This medium was found to be of great value for the detection of small numbers of hemolytic streptococci and for the detection of nonhemolytic streptococci when these are present in large numbers. When few nonhemolytic streptococci are present blood agar is a less useful medium, owing to the difficulty of distinguishing the streptococcus colonies from those of bacteria normally existing in udder milk.

Pneumonia of bovines due to Pasteurella boviseptica, W. Tweed and J. W. Edington (*Jour. Compar. Path. and Ther., 43 (1930), No. 3, pp. 234–252*).—In the first part of this account a clinical report is made by W. Tweed (pp. 234–239), and in the second part a pathological report by J. W. Edington (pp. 239–252).

Toxic effect of St. Johnswort (Hypericum perforatum) on cattle and sheep, C. D. Marsh and A. B. Clawson (*U. S. Dept. Agr., Tech. Bul. 202 (1930), pp. 24, figs. 4*).—In work conducted cooperatively by the U. S. D. A. Bureau of Animal Industry and the University of California a quantity of St. Johnswort (*H. perforatum*) was collected at different times and fed to cattle and sheep during the years 1925 to 1928, inclusive. Cattle and sheep were affected by these feedings, showing high temperature, rapid pulse and respiration, tendency to diarrhea, and mild dermatitis. Although the plant is evidently toxic, deaths rarely occur and ordinarily the poisonous effects are not very pronounced, and when so, only after a large dosage. Dermatitis was produced in only a few cases and in those was slight, not being at all comparable with that described in literature. As one of the possible forage plants on the ranges of California, St. Johnswort is not likely to be a source of much trouble because of its toxic properties.

A list is given of 29 references to the literature, *H. perforatum* having long been considered an important stock-poisoning plant in Europe, northern Africa, and Australia.

Broad-leafed milk weed (Asclepias latifolia) poisonous for sheep and goats, E. A. Tunnicliff and V. L. Cory (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 165–168*).—In work at the Sonora, Tex., Substation the broad-leafed milkweed was found to be poisonous for sheep and goats. The lethal amount of dried leaves was found to be less than 0.19 per cent per body weight of these animals. Abdominal pain, excessive salivation, labored respiration, and restlessness, together with the position in which the body is found, were the most important of the symptoms observed. The congested, swollen, dark red colored liver; congested, swollen, degenerated spleen; and ripened

blackberry color of the splenic pulp, plus the congested, catarrhal, or hemorrhagic gastroenteritis, are typical macroscopic lesions.

Brucelliasis in sheep, E. A. Bruce (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 6, pp. 841, 842*).—The author records *Brucella abortus* as the cause of abortion in sheep in a flock on Vancouver Island. This is thought to be the first record of its occurrence in sheep under natural conditions reported from North America.

An outbreak of coccidiosis in lambs, I. E. Newsom and F. Cross (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 232–235, fig. 1*).—This contribution from the Colorado Experiment Station reports upon an outbreak of coccidiosis which appeared in feeder lambs in November and December, 1929. "Nine lots, comprising 13,447 lambs, were involved, in which the morbidity rate was 24 per cent and the mortality rate 3 per cent. The only factor common to all lots was that they had been shipped recently. Coccidia (*Eimeria faurei*) were numerous in the feces. A method of treatment is described that was apparently successful."

Pyobacillosis in sheep, W. Jowett (*Jour. Compar. Path. and Ther., 43 (1930), No. 2, pp. 109–117, figs. 2*).—A brief account is given of investigations conducted by the author on material, mainly the lungs and related lymphatic glands of diseased sheep, obtained during the year from the Edinburgh abattoir. An organism was encountered in certain lesions which bears a close morphological resemblance to but is distinct from *Corynebacterium pyogenes* (*bovis* and *suis*). This organism is considered to be *C. pyogenes* (*Bacillus pyogenes*), which has apparently become adapted to the sheep, in passage through which animal it has undergone certain modifications.

A study of the leucocyte changes in the blood of diseased swine, F. Thorp, jr., and R. Graham (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 198–203*).—The results of comparing the gross pathologic diagnosis with the white cell count on 41 obscure cases of swine disease suggest that a leucopenia may occur in hog cholera. Leucopenia is not, however, an infallible guide in this infection. Gross pathologic lesions of hog cholera were found in 27 (66 per cent) of the 41 cases studied, while leucopenia prevailed in this group with an average of 7,700 leucocytes per cubic millimeter. A distinct leucopenia was encountered in 4 of the 6 cases of acute edematous bronchitis of "flu" in swine. Erythrocyte counts failed to disclose significant changes in the blood of the cases examined.

[Summary of a report on oesophagostomiasis in pigs, E. W. Nighbert] (*Jour. Parasitol., 17 (1930), No. 1, p. 57*).—A brief report on a herd of 73 pigs, raised under the swine sanitation system but which failed to thrive despite favorable conditions as regards feed, pasture, housing, etc., that were found on post-mortem examination to be extensively infested with nodular worms.

The incidence of swamp fever in Saskatchewan in relation to soil type, J. S. Fulton (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 157–164, fig. 1*).—A general discussion based in part upon the literature is followed by reports of test inoculations and tests of the infectiousness of slough water. The work indicates that many animals contract the disease as colts, and that the symptoms go unnoticed because of their not being worked. Horses which have never shown symptoms of swamp fever may be virus carriers, and in some cases blood from these animals has proved to be particularly virulent. For this reason local horses were unsatisfactory for experimental work.

A preliminary report on a test for swamp fever, J. S. Fulton (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 1, pp. 58–61, fig. 1*).—The author gives a preliminary report upon the mercuric chloride test for swamp fever from which

encouraging results were obtained in comparison with those secured from tests described as being capable of detecting infected animals.

Parasitism and fistulous withers, J. E. ACKERT and W. S. O'NEAL (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 1, pp. 28–36, figs. 7*).—Ten of 12 examinations made at the Kansas Experiment Station of portions of the ligamentum nuchae, which, with the exception of one mule, were all taken from horses, showed either portions of the parasitic worm *Onchocerca cervicalis* or calcified areas characteristic of previous infestations of this parasite.

Animal parasites of chickens in Ohio and West Virginia, J. H. RIETZ (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 154–156*).—Cestodes were found by the author to rank first in number of infestations, occurring in 79 of 132 flocks examined. Heterakidae ranked second, being found in 54 of the flocks; and ascaridia third, occurring in 30 flocks. Coccidia were fifth, being found in 14 flocks, while gizzard worms and gregarines were each found in 5 flocks.

The comparative pathology of anaemia and leucocythaemia in fowls, H. P. BAYON (*Jour. Compar. Path. and Ther., 43 (1930), No. 3, pp. 188–204*).—The results of experiments, observations during life, and necropsies have shown that certain specific avian hemopathies can be classed as (1) oligoerythrocythemias, (2) leucocythemias, and (3) lymphocythemias. These originated as proliferative conditions of definite tissues in the marrow.

The effect of the Brucella group of microorganisms on chickens, S. H. McNUTT and P. PURWIN (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 212–217*).—In attempts made to infect 103 chickens artificially with different strains of the Brucella organism, neither feeding nor injecting the microbe produced any apparent symptoms either immediately following exposure or for a period of five months thereafter. When the organism was fed to normal chickens, agglutinins were produced which disappeared in many of the birds in less than 41 days. It was not recovered from chickens to which it had been fed. When suspensions of the organism were injected subcutaneously, intravenously, or intraperitoneally, agglutinins appeared in the blood within a very few days, but lesions were confined to the point of injection, except in one bird, and showed no distinguishing characteristics. Twenty-two days was the longest time after injection that the organism was recovered from such birds. Reacting birds showed no symptoms of disease, and there was no apparent sickness in any of the flocks.

The serologic diagnosis of pullorum disease in domestic fowls, I, II (*Jour. Immunol., 18 (1930), No. 5, pp. 353–377; fig. 1; pp. 379–392*).—Two papers are presented, as follows:

I. *Variation in agglutinability of Bacterium pullorum and elimination of the so-called "cloudy" reaction,* E. P. Casman, G. Valley, and L. F. Rettger.—This contribution reports upon experimental work with constancy in the agglutinability of three strains of *B. pullorum*. "It is shown that the usual variations in the cultural conditions such as temperature, original pH of the agar medium, and frequency in transferring cultures have less influence on agglutinability than the final pH of the culture antigen and the temperature at which the agglutination is conducted. Antigens adjusted to pH 6.4 and to pH 8 were more agglutinable than the same antigens adjusted to pH 7. At 37° C. the rapidity and degree of agglutination were much greater than at 16°.

"Attempts to select daughter strains of different agglutinability were unsuccessful, indicating further that the strains with which these studies were conducted are remarkably constant in their agglutination property.

"The factors influencing and causing the so-called cloudy reaction were studied. It was found that by employing phenol in concentrations of from 0.2 to 0.3 per cent and adjusting the H-ion concentration of the antigen to pH 8.2 to 8.5, the formation of the flocculent precipitate was prevented. At this H-ion concentration the bacteriostatic action of the phenol (0.2 to 0.3 per cent) is apparently complete. The suppression of the pH by sera which tend to produce cloudy reaction when added to the agglutination fluid is reported here apparently for the first time.

"Antigens adjusted to a definite pH by means of alkali or buffer should find general application in the elimination of interference in the routine agglutination test by the so-called cloudy reaction."

II. *The chemical nature and the mechanism of the "cloudy" reaction*, G. Valley and E. P. Casman.—It was found that the precipitate obtained in the agglutination tube consists of protein and lipoid fractions. "It is suggested that under the conditions (increased H-ion and salt concentration) prevailing in the agglutination tube a lipin-protein complex formed from substances in the serum is precipitated. Evidence is cited to show that phenol in 0.5 per cent concentration may cause precipitation of certain protein constituents of serum. It is further indicated that, aside from the metabolic changes accompanying egg laying, such factors as muscular exercise or shock may influence the pH and the lipoid content of the serum and, consequently, cause cloudy reactions. While the predisposing causes for the cloudy reaction undoubtedly arise in the serum, the phenomenon of precipitation is nevertheless profoundly influenced by the conditions prevailing in the agglutination tube."

A comparative study of the routine macroscopic agglutination and the intracutaneous (wattle) tests for Bacterium pullorum infection in poultry breeding stock, L. F. Rettger, J. G. McAlpine, and D. E. Warner (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 1, pp. 47–57*).—In the two experiments conducted at the Connecticut Storrs Experiment Station, here reported, a high degree of correlation was obtained between the different agglutination tests made at different times on the same birds and between the agglutination tests and the post-mortem observations. The intracutaneous test gave results which very often failed to agree with those obtained by the two other methods of diagnosis. The discrepancies were most marked with the so-called negative groups and were so great in the second experiment as to render the method as applied useless.

Coccidiosis in fowls, A. J. Durant (*Missouri Sta. Bul. 289 (1930), pp. 8, figs. 2*).—This is a practical account.

Gapeworm disease of birds in Alaska (*Jour. Parasitol., 17 (1930), No. 1, p. 56*).—A. H. Twitchell has observed sparrows and other birds to be suffering from gapes in three different places in Alaska, all being in wild country with no chickens or turkeys in the vicinity. On the other hand, numerous inquiries in towns in the Moore Creek Flat part of Alaska failed to bring to light any authentic cases of gapes in chickens. These findings suggest that there may be numerous wild birds of North America which harbored this parasite before its spread to domestic fowls.

Hypernephromas in the common fowl, F. P. Mathews and F. L. Walkey (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 218–224, figs. 6*).—In this contribution from the Indiana Experiment Station six spontaneous tumors of the common fowl are described. The epithelium in these cases was found to resemble that of the adrenal gland. The point of origin could not be definitely determined.

Pathological conditions ascribed to nematodes in poultry, E. B. CRAM (*U. S. Dept. Agr. Circ. 126 (1930), pp. 11, figs. 6*).—A brief review of the instances of reported pathogenicity of the nematodes of poultry is said to indicate a wide range of pathological conditions which may result from such parasitism. The data are presented under the headings of striking clinical symptoms, clinical effects of a chronic nature, and pathological changes due to nematodes.

It is pointed out that the "gross examination of living birds may show the eyes directly or indirectly affected by parasitic nematodes. Clinical symptoms of internal parasitism include dyspnea and asphyxiation; a chronic condition of cachexia, emaciation, or retardation of growth, and anemia; deranged appetite; diarrhea; and paralysis or muscular incoordination. Pathological changes which have been observed include inflammation of the various parts of the digestive tract, formation of nodules or of tumors, stenosis, impaction or occlusion, rupture, production of hemorrhages, changes in the cardio-vascular system, deposit of urates, injury to the thymus gland, reduction of sugar content of the blood, and the facilitating of the entry of other infections. The species of nematodes which are reported as causing these conditions represent various taxonomic groups, so there is no evidence that a pathological significance is restricted to any one group."

Active immunisation of fowls against fowl plague, H. S. PURCHASE (*Jour. Compar. Path. and Ther., 43 (1930), No. 2, pp. 151–157*).—In experimental work with a phenol-glycerine vaccine 19 of 46 birds survived after 3 inoculations, of which only 9 were found immune after a test dose of virus given 7 days after the last dose of vaccine. In the preparation of vaccines in which virulent fowl plague muscle was used, it was found that normal liver material hastened markedly the devitalization of the virus, and that this was probably due to its bile content, as the addition of bile was found to be even more effective. Phenol-glycerine fluid was used in the same proportions to the virulent material as in the vaccine preparations.

Pseudomonas pyocyanea a significant factor in a disease of chickens, H. E. ESSEX, F. D. MCKENNEY, and F. C. MANN (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 174–184, figs. 7*).—It is pointed out that *P. pyocyanea* may cause a variety of diseases in man and animals, it having been shown to be at times pathogenic for cattle and hogs. The epizootic here reported occurred in a flock of 400 young chicks, 25 per cent of which recovered from the disease. A slender Gram negative rod which appeared to be *P. pyocyanea* was isolated from 95 per cent of the fatal cases studied, which, with the exception of those experimentally injected, had apparently succumbed to an acute septicemia. Approximately 50 per cent of the chicks taken from the flock which had passed through the disease gave complete agglutination in dilutions up to 1 : 100, while normal chicks tested proved to be negative.

Lung lesions in avian tuberculosis, L. R. VAWTER (*Jour Amer. Vet. Med. Assoc., 77 (1930), No. 1, pp. 103, 104*).—The author reports the finding of lung lesions in 47 reactor hens, mainly 2 years old, removed from a flock of 135 by the Nevada Experiment Station. The percentage of lung lesions was much higher than ordinarily observed.

***The susceptibility of the turkey, pigeon, pheasant, duck, and goose to* Brucella disease,** M. W. EMMEL (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 2, pp. 185–197, figs. 6*).—This is a report of work conducted at the Michigan Experiment Station in continuation of that previously noted (E. S. R., 63, p. 775). While all the above-mentioned birds appear to be susceptible to infection by the species of the genus Brucella when fed massive doses, the

disease was fatal in the turkey only (in 80 to 119 days). Symptoms of the disease in the turkey were paleness about the head and wattles, diarrhea, and emaciation, there being very few symptoms in the other fowls. The turkey and the pheasant consistently developed specific agglutinins. The pigeon, duck, and goose exhibited a varying ability to produce specific agglutinins, especially when exposed by the oral route.

"Keel disease" in ducklings in Britain, S. H. GAIGER and G. O. DAVIES (*Jour. Compar. Path. and Ther., 43 (1930), No. 2, pp. 125–141*).—An outbreak of keel disease in ducklings which appears to be the first recorded outbreak in Britain is described. The causative organism was found to be culturally, pathogenically, and serologically identical with or very closely related to *Salmonella anatum* Rettger and Scoville of the non-aertrycke type.

"Our present view is that the pathogenic powers of the *S. anatum* are of a low order, that possibly the organism may be found to be a normal inhabitant of the intestines of ducklings, and, further, that the capacity to become pathogenic depends upon the operation of some predisposing factor, as in this case feeding with fermented foods. Having acquired pathogenic properties, the bacterium rapidly causes an enzootic which is kept in being by the presence of ducklings of the susceptible age. In this outbreak the absence of susceptible ducklings for a period of a few weeks was sufficient, after the removal of the predisposing factor, to stop the outbreak."

AGRICULTURAL ENGINEERING

Progress of agricultural engineering research, 1929, R. W. TRULLINGER (*Agr. Engin., 11 (1930), No. 8, pp. 271–276, figs. 5*).—A critical review of outstanding features of the agricultural engineering research in progress at the State agricultural experiment stations and elsewhere during 1929 is presented in this contribution from the U. S. D. A. Office of Experiment Stations.

The finding is that research in agricultural engineering, while not yet of startling proportions or quality, is assuming an air of stability and experiencing a gradual healthy growth which speaks well for those engaged in the promotion and prosecution of the work. The importance of preliminary clarification of a field of research is evident, especially where it leads to the identification of important lines of inquiry and stimulates the fundamental study of the individual problems involved. The necessity for cooperating with the agricultural sciences concerned and with other collateral sciences is also emphasized, and finally the entire discussion points to the fact that a highly trained research personnel is essential to the success of the work.

Scheme for the classification of agricultural engineering matter (*Internatl. Rev. Agr., Mo. Bul. Agr. Sci. and Pract. [Rome], 20 (1929), No. 12, pp. 496–500*).—This scheme is briefly outlined.

Reinforced concrete bridges, W. L. SCOTT (*London: Crosby Lockwood & Son, 1928, 2. ed., enl., pp. XII+220, pls. 26, figs. 116*).—This is a revised and enlarged edition of the work previously noted (E. S. R., 53, p. 683).

The theory of external loads on closed conduits in the light of the latest experiments, A. MARSTON (*Iowa Engin. Expt. Sta. Bul. 96 (1930), pp. 36, figs. 11*).—The final results of an investigation conducted by the station in cooperation with the U. S. D. A. Bureau of Public Roads are presented in the form of data on and mathematical expressions of the theory of external loads on closed conduits.

Wood construction, D. F. HOLTMAN (*New York and London: McGraw-Hill Book Co., 1929, pp. XII+711, figs. 306*).—This handbook is an attempt to supply a rapidly growing need on the part of architects, engineers, and builders for

complete and practical information on the use of wood in construction. Fundamental facts concerning the nature and available forms of wood, and fundamental principles on the use of wood, constitute the most important part of the book. The aim has been to furnish basic information for use in designing and specifying wood construction, and to aid in the efficient selection and application of the material and in the adoption of efficient and economical forms of design.

The first seven chapters include information on the factors affecting the use of wood in construction; lumber grading, grade provisions, and working stresses; the principal woods used in building and construction; the identification of common woods; preservative treatment; the use of paints and stains; and methods of preventing termite damage. The last four chapters contain information on approved methods of using lumber in light building construction and millwork, and in both heavy timber and temporary construction. In an appendix are given compilations showing the standard grades produced in the various species and tables of the lumber grades used for various construction purposes.

Stresses in heavy helical springs, E. LATSHAW (*Jour. Franklin Inst., 209 (1930), No. 6, pp. 791–808, figs. 7*).—An analysis of these stresses is given and formulas for design derived.

Lubricants and fuels for tractor and motor vehicle engines, H. T. KENNEDY (*Agr. Engin., 11 (1930), No. 7, pp. 241–244, figs. 2*).—In a contribution from the U. S. Bureau of Standards, a brief summary is given of the points of outstanding importance in connection with the choice of suitable lubricants and fuels and their economical purchase.

A machine for distributing sulphate of ammonia in the fertilization of rice, R. BAINER (*Agr. Engin., 11 (1930), No. 7, pp. 239, 240, figs. 4*).—This machine, which was developed at the California Experiment Station, is illustrated and briefly described. Its essential parts are a two-wheeled truck, upon which the mechanism is supported, a feed hopper, feed control, regrinding feed tube, fan, and distributing system. The mechanism is driven by a power take-off.

The engineer and tillage research, H. B. WALKER (*Agr. Engin., 11 (1930), No. 8, pp. 281–285, figs. 2*).—In a contribution from the California Experiment Station an analytical discussion is presented of the tillage problem from the engineering viewpoint. It is pointed out that the most effective endeavor of the agricultural engineer in the development of new data for a better understanding and for more efficient practices in tillage problems is to develop ways and means of metering the various energy demands of tillage machinery operating under varying conditions and of correlating these data with production returns. He should study carefully the relation of power and machinery units to timeliness of tillage operations and work with the biological scientists in determining the requirements of tillage practices to meet the conditions for profitable crop production. He should also seek analytical methods of measuring soil tilth.

The electric hotbed, R. H. DENMAN (*Agr. Engin., 11 (1930), No. 8, pp. 285, 286, figs. 2*).—The details of an electric hotbed are briefly described and illustrated. Studies on the problem of supplying artificial light to supplement sunlight and avoid the necessity of reducing the temperature surrounding the plants indicated the practicability of supplying the heat from light sources placed above the plants. An experiment on this basis resulted in the production of stockier and darker colored plants, and the plants developed more rapidly. Radishes grew their second pair of leaves within seven days from sowing, which was several days in advance of the underheated plants. It

appeared probable that warming the plants and the soil directly by radiant heat, the surrounding air being at a lower temperature, may be an advantage. If so, the method of supplying heat from a light source will be well adapted to the heating and ventilation of hotbeds.

Frame building design revolutionized, F. P. Cartwright (*Agr. Engin., 11 (1930), No. 7, pp. 235–239, figs. 14*).—The results of experiments on frame building design, conducted cooperatively by the U. S. D. A. Forest Products Laboratory and the National Lumber Manufacturers' Association, are briefly summarized.

Preliminary investigations showed that the walls contribute most to the strength and rigidity of a building as a whole. It was determined also that typical lumber-framed and sheathed walls are strong enough to resist any pressure likely to be caused by wind blowing directly against them. Wall resistance to end thrust, caused when the pressure against the front is transmitted to the side walls, is a more critical point.

In the main experiments the Laboratory built and subjected to end thrust nearly 50 frame walls of full story height, 8 and 9 ft., and long enough, 12 and 14 ft., to show how a real wall would act under extreme conditions. These walls were framed with two-by-fours at the usual 16-in. spacing. The sole plate was bolted to a fixed base, and pressure was applied horizontally at the top plate in the plane of the wall surface. End posts, corresponding to the corner posts of a house, were built up in the usual way with three two-by-fours.

The results showed that three nails per stud in horizontal sheathing boards do not increase the wall stiffness appreciably, since the middle nail of the three is about at the center of the resistance couple set up by the outside nails. Four nails per stud in 1 by 8 in. horizontal sheathing increase the strength and stiffness about 40 per cent. The resistance of the inner pair of nails to twisting is naturally less than that of the outside pair. The effect of more nails on diagonal sheathing is much more important. Here the sheathing boards act with the framing as tension or compression members of a small truss, and each additional nail holding them in place adds considerably to the strength of the whole. Three nails instead of two increased the stiffness from 3.8 average to 5.2, and four nails brought it up to 7.5.

When a horizontally sheathed panel gives way, due to end thrust, it is usually the nails which give way first. They bend and twist before the wood splits. Heavier nails were found to make a stiffer, stronger panel. Two 10-penny instead of two 8-penny nails increased the stiffness of a horizontally sheathed panel 50 per cent, and the strength 40 per cent. When 12-penny nails were used strength and stiffness fell off again, perhaps because the large shanks split the boards more seriously. Larger nails made little improvement in the strength of diagonally sheathed panels, because the boards are not twisted about the studs when such panels resist pressure, and the greater strength of the nails was not brought into play. With two 8-penny nails per stud, a diagonally sheathed panel is about 8 times as strong and from 4 to 7 times as stiff as a similar panel horizontally sheathed.

Herringbone bracing increased the stiffness of a horizontally sheathed panel only 30 per cent and the strength only 10 per cent. Two by four braces cut in between the studs brought improvements of 60 and 40 per cent. The important discovery made in this connection was that 1 by 4 in. strips, let into the faces of the studs beneath horizontal sheathing, increase the stiffness from 2.5 to 4 times, and the strength about 3.5 times. One by six in. side and end-matched sheathing boards gave as good results as 1 by 8 in. butt-edged boards.

To discover what happens when lumber dries out, 2 panels were sheathed horizontally and 2 diagonally with green lumber. These were given a month under cover to dry out and were then tested. The horizontally sheathed panels lost in drying about 40 per cent of the normal stiffness and 30 per cent of the strength of dry-sheathed panels. The diagonally sheathed panels decreased in relative stiffness from about 4 to 1.7.

A double 28-in. window in a diagonally sheathed wall reduced its stiffness about 20 per cent and its strength about 40 per cent. Adding a 3 by 7 ft. doorway decreased the stiffness 65 per cent and the strength 50 per cent. The wall was still twice as rigid and several times as strong as a horizontally sheathed wall with the same openings. Framing a door and window into a horizontally sheathed panel decreased strength and stiffness 20 and 30 per cent, respectively.

Wood lath and plaster installed on a panel without sheathing afforded 7 times the stiffness and 4 times the strength to be expected from horizontal sheathing. It increased the stiffness of a horizontally sheathed panel with window and door openings over 200 per cent. Wood lath and plaster with horizontal sheathing and let-in braces around openings made a panel slightly stiffer than diagonal sheathing with the same openings, and nearly as strong. The influence of wall and partition openings in causing plaster cracks is thoroughly apparent from the results with plastered panels. The top plates of those without openings moved about ⅜ in., and a thrust of 8,000 to 12,000 lbs. was necessary before plaster cracks developed. Eight hundred to 1,500 lbs. thrust and only a few hundredths of an inch movement caused cracks in those with openings.

Data are also included on the effects of vibration, indicating little decrease in strength or stiffness from this cause.

Poultry house construction, F. C. Elford and H. S. Gutteridge (*Canada Dept. Agr. Bul. 132, n. ser. (1930), pp. 40, figs. 40*).—Practical information is given on the subject, together with general and detailed working drawings.

The relation of environmental conditions in poultry houses to winter egg production, C. W. Smith (*Nebraska Sta. Bul. 247 (1930), pp. 34, figs. 17*).—Studies, covering 7 seasons and involving 4,527 hens, are reported on the effect of temperature, humidity, ventilation, and artificial light on winter egg production.

Insulation had a beneficial effect on winter egg production. The uninsulated check house was always low in egg production in January and February. Closing a house up tightly all night during the winter season had no detrimental effect on winter egg production, and while this procedure showed no merits that would warrant its being recommended for general practice, it did show that hens can thrive in an environment where there is very little air change. Steam-heated radiators, when used to keep a minimum temperature of 50° F. in poultry houses, increased egg production in December, January, and February. A smaller increase was produced in December than in the latter months. The hens in the heated houses slumped during March, when their production fell slightly below that of the hens in the unheated houses.

The use of a small stove to lower the humidity but not to raise the temperature appreciably proved to be of doubtful value as measured by winter egg production. No correlation was found between humidity and winter egg production.

There was no advantage in the use of a commercial ventilator on a heated house, and apparently only slight advantage in its use on an unheated house.

The results over 2 seasons and involving 4 houses and 740 hens indicate that the use of a commercial ventilator will not increase winter egg production sufficiently to pay for the ventilator and its installation. An electric fan for stirring the air, operated in 1 of the heated houses for 3 seasons, and an exhaust fan, which moved large quantities of air from 1 heated unit the last 3 seasons of the experiment, produced no results warranting their installation. Muslin-covered transoms offset much of the advantage gained by insulation. They permit but little air change. Artificial lighting is a very potent factor in increasing egg production in the winter. One unheated and uninsulated house was artificially lighted 2 seasons before lights were installed in all houses. During those 2 seasons its production exceeded that of any other house.

Stock tank and poultry water heaters, H. BERESFORD (*Agr. Engin., 11 (1930), No. 8, pp. 279, 280, figs. 2*).—Experiments conducted at the Idaho Experiment Station on electrical heating of drinking water for poultry showed that the first few days more water was used at 50° F. than when the temperature was maintained at 40°. However, when the birds became accustomed to the warm water the consumption dropped back to the same amount consumed at the lower temperature.

A comparison of the pens receiving the 40 to 50° water and the pens receiving water in which ice was allowed to form, gave an egg production record decidedly in favor of the pens receiving the warm drinking water. Where the drinking water was maintained at between 40 to 50°, approximately 20 per cent more water was used than the same flock of 800 pullets required when the water was allowed to remain at a freezing temperature.

During the days that the temperature of the poultry house averaged 18°, the heating element was required to operate 20 out of every 24 hours in order to keep the drinking water at the required temperature. The average energy consumption for the 30-day period was 3 kw. hours per day. During the coldest weather, room temperature of 18°, a maximum of 6 kw. hours per day was used. The advantage of the thermostatic control as used in connection with this poultry water heater is that the temperature of the drinking water never exceeds 50° even though the water in the trough is lowered to within an inch or less of the bottom. This is not the case when the small stove type heater is used, for as the amount of the water decreases the temperature rises until rapid evaporation occurs and there is danger of having the drinking water too warm.

Experience at the Aberdeen Substation on the electrical heating of stock water is also described.

Structures for farm storage of wheat, H. M. BAINER (*Agr. Engin., 11 (1930), No. 7, pp. 249–251, figs. 5*).—Such storages are briefly described and illustrated.

Effect of types of storage bins upon quality of wheat, F. C. FENTON (*Agr. Engin., 11 (1930), No. 7, pp. 247–249*).—Studies conducted at the Kansas Experiment Station are reported. Eleven grain bins of approximately 500-bu. capacity were used. The bins included 2 wooden bins, one of which was lined with Celotex. There were also 3 concrete bins, 2 of concrete stave type similar to silo construction and 1 square bin made of concrete boards with a wall 5 in. thick. There were 6 steel bins, 2 of which had ventilated side walls and a large central ventilating flue on top of which was mounted a suction cupola, while the other 4 were tight wall steel bins of the type very commonly used in Kansas.

The results showed to the disadvantage of the concrete and tight-wall steel bins. In every case the tight-walled bins seemed to heat more than those with ventilation. The wooden bins also seemed to keep the grain in better condition than the steel or concrete, although no excessively damp wheat was stored in them. The case of the insulated bin is interesting because of the uniformity of the temperature of the wheat. The opinion is expressed that insulation may be a valuable factor in preventing wheat damage. The heat of the sun in August shining upon the steel bins seemed to be a definite aid in starting the heating action.

The results as a whole seemed to indicate that well-ventilated steel bins are much safer than tight-walled steel bins for the storage of damp wheat. It may also be that the ventilated wooden bin is a better type than any of the others. To store damp wheat safely in concrete bins the farmer must be able to move the wheat in order to cool and dry it. In damp wheat years wheat stored in any kind of a bin is likely to need moving. Based upon the movement of 16 bins of wheat during the summer, it seems that the temperature of the wheat can be lowered about two-thirds of the difference between the wheat temperature and air temperature.

A bibliography on grain storage is included.

Annual report of the department of sewage disposal for the year ending June 30, 1929, W. Rudolfs (*New Jersey Stas. Bul. 502 (1930), pp. 40, figs. 16*).—This report contains among other things data on the performance of several sewage-disposal plants and reports the results of certain specific investigations.

Studies by W. H. Baumgartner on the effect of certain chemicals on the vacuum filtration and gravity drying of ripe sludge showed that ferric chloride is the most effective treating chemical for ripe sludge. It has a threefold effect in sludge drying and filtration; namely, discharge of the dispersed material, causing coalescence; change of the hydrogen-ion concentration, thus approaching the isoelectric points where maximum precipitation of the colloidal material takes place; and finally, liberation of carbon dioxide, making the material porous and helping in its flotation. There are peaks in the filtration of ferric-chloride-treated sludge which correspond to definite pH values. These peaks are at a concentration of 2 and 7 lbs. to the cubic yard of sludge, respectively. Ferric chloride increases the amount of drainage from sludge drying on beds and thus decreases the time for evaporation. Treated sludge has a porous nature which allows more surface for evaporation. Moisture is removed more rapidly by treating ripe sludge with ferric chloride.

Studies by Rudolfs and I. O. Lacy, dealing with the relation between drainage and evaporation of drying sludge, indicated that up to a temperature of 130° F. drainage is a more important factor than evaporation. Evidently, covering sludge beds with greenhouses is most important from the standpoint of keeping rains off the beds, unless the greenhouses are heated to a comparatively high degree and the evaporating moisture is removed.

According to the results of studies by A. J. Fischer, drying of fresh solids in the open is not feasible when treated with lime, alum, or a mixture of lime and alum on account of poor drainage, objectionable odors, or both.

Studies by H. Heukelekian on certain organic constituents of fresh and ripe sewage sludge showed that the most abundant constituents of the organic matter of fresh solids are fats and crude proteins. Materials present in smaller percentages are water-soluble and alcohol-soluble substances, hemicellulose, cellulose, and lignin. Of these constituents fats and cellulose show the greatest decrease in the ripe sludge. Resistant substances like waxes and lignin, in-

cluded in the alcohol-soluble fraction, are not decomposed readily and are, therefore, present in the ripe sludge in larger percentages than in the fresh solids.

RURAL ECONOMICS AND SOCIOLOGY

Farm management and incomes of farm families in Laurel County, Kentucky, W. D. Nicholls and H. W. Hawthorne (*Kentucky Sta. Bul. 305 (1930), pp. 219-283, fig. 1*).—This report presents an analysis of the farm business and the sources and uses of the incomes of 203 farm families. The study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and covers the farm year 1927. The data were collected by a survey made in the summer of 1928.

Tables are included and discussed showing (1) for all the families, the value per family of things furnished by the farm and purchased, and the kinds and amounts of income and outgo per family classified by amount of cash income of family, size of family, and crop acreage per farm; and (2) for the farmers grouped on the basis of whether their chief source of income was farming, contributions of relatives, pensions, etc., or work away from the farm, the sources of spendable income, crop acreage and number of livestock, investments, receipts and operator's earnings, perquisites furnished by the farm, and farm expenses.

Other tables show for the 90 farms in the group where the operator's chief source of income was farming the relation of acreage of intensive crops, number of crop acres, receipts per acre, and crop yield to income and of labor accomplishment to farmer's profit. Comparison is made of the profits and the factors affecting profits on the 18 most profitable and the 18 least profitable farms. The organization and management of four successful farms of different types are described, and plans suggested for a farm of 28 acres in crops and 20 acres in permanent pasture, and one of 36 acres in crops and 12 acres in permanent pasture.

Farm practices in south central Mississippi with suggested changes, L. E. Long and R. S. Kifer (*Mississippi Sta. Bul. 276 (1929), pp. 59, figs. 19*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is based on detailed farm business records obtained from 19 Jones County farmers in 1927 and 15 in 1928, 11 of whom reported both years. Tables included show for each year the crops produced; yields obtained; fertilizer, labor, and other crop production costs; number of livestock on farms; production obtained; and the feed, labor, and other cost items for livestock. Suggestions are made for improvement in the management of the farms.

Farm management and net income, L. E. Long (*Mississippi Sta. Circ. 89 (1930), pp. 5*).—Tables are included showing for 80 Choctaw County farms divided into two groups having in 1928 average net incomes of $471 and $174, respectively, the average investments by items, distribution of land and crop acreage, yields and crop sales, amount and kind of fertilizer used for cotton and the cost thereof, expenditures in producing different crops, estimates of value of products used in the home, number of livestock, sales of livestock and livestock products, value of feeds and hired labor used in livestock production, and miscellaneous receipts and expenditures. The data were obtained by the survey method during February and March, 1929.

Farm tenancy in central Kentucky, W. D. Nicholls (*Kentucky Sta. Bul. 303 (1930), pp. 123-185, figs. 5*).—The chief objects of this study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., were to make available facts concerning the present status and trend of tenancy in this

area, the condition of tenants with respect to property ownership, standards of living, personal and community relations of tenants and their families, the earnings of landlords from tenant-operated land, the important factors determining satisfactory earnings of tenants and landlords, and other facts bearing on the tenancy problem.

The 33 counties covered by this study include most of the Kentucky Burley tobacco region, which embraces about one-fifth of the area of the State, and one-third of the value of all farm land of the State. The changes in the percentage of tenancy in the several counties, 1880-1925, the tenure status of farmers, area and value of land operated by tenants and owners, tenure status related to size of farms, and the relation of changes in the acreage of tobacco and other crops to changes in the percentage of tenancy are discussed.

Detailed reports (176 farms for 1924, 61 for 1926, and 51 for 1927) were secured for the 6 inner counties of the area on the length of time operator had been a tenant, his accumulation during the period, nature and terms of his contract, amount and cost of credit used, crops and livestock grown, total receipts and expenses and net income, family expenditures, and membership and participation in community activities; investment, receipts, expenses, and net income of landlords; and other phases of the tenancy problem. An analysis of the 1924 records is made, following which the data for 1926 and 1927 are presented together with the 3-year averages for the farms for which records were obtained in each of the 3 years. The chief factors affecting tenants' profits and landlords' returns from share-renting are discussed.

The percentage of tenant farmers in the area increased from 25.8 in 1880 to 39.7 in 1920, and then decreased to 37 in 1925. In the 6 inner counties the percentages were 24, 49.9, and 44.7, respectively. In 1925 tenants operated 20 per cent of *all* farm land and 36 per cent of the crop land in the area. Owner-operated farms averaged a little more than twice as large as tenant-operated farms. Size of families was practically the same on both types of farms. The coefficient of correlation of the percentage of land in tobacco and the percentage of tenancy in the 33 counties was +0.68 for 1920 and +0.56 for 1925. The average labor income for the 176 tenants in 1924 was $690 and the average net earnings $1,081. The average labor income and net earnings increased from $199 and $501, respectively, for those having sales of tobacco per acre of $149.90 or less to $1,050 and $1,517, respectively, for those having per acre sales of $330 and over. The farms using 25.99 and less productive work units per $100 worth of labor cost had an average labor income of $305 and average earnings of $617, while for those using 50 units or more the average labor income was $1,002 and the average net earnings $1,436. Where the value of things furnished by the farm to the family living was $199 or less, the average labor income was $441 and the average net earnings $563; and where the value was $575 and over, the average labor income was $998 and the average net earnings $1,792. The average net returns of all landlords for the 3 years were for 1924, 13 per cent; 1926, 8 per cent; and 1927, 16 per cent. The average of 12.2 per cent for the 3 years would have been 5⅓ per cent had the acreage in tobacco (average 9.9 acres) been used for growing corn.

Social and economic effects of land speculation on farm families in central Kentucky, M. Oyler (*Kentucky Sta. Bul. 300 (1930), pp. 31–64, fig. 1*).—Schedules were obtained from 167 purchasers who had purchased 169 farms in 6 counties totaling 18,501 acres during the period 1918–1922. Of these farms, 133 had been resold at an average loss of 38.4 per cent of the total cost (purchase cost plus cost of added improvements). The estimated decrease in inventory value of the 36 farms not resold was 40 per cent. The losses to the

original sellers, note holders, and others; occupations of the purchasers before purchasing and after selling again; shifts in occupations and tenancy; changes in community participation of the purchasers after their loss; effects of losses on the occupations of purchasers and the schooling of their children; and the attitudes of the purchasers are discussed.

Taxation as related to the property and income of Ohio farmers, H. R. Moore (*Ohio Sta. Bul. 459 (1930), pp. 41, figs. 8*).—This bulletin is based upon data regarding taxes paid by Ohio farmers derived from the records of the State tax commission and county officers, data of the station on the income of Ohio farmers, information on cash rents from reports of the Federal-State Division of Crop and Livestock Estimates, data relative to taxes and income on owner-operated farms from the account records of farmers, and information collected by personal interviews and mailed questionnaires.

Tables are presented and discussed showing (1) by years, 1920–1928, the estimated amount of taxes of different types paid by Ohio farmers, and the percentages which property taxes and assessments and all taxes were of gross and net cash and total net income; (2) the estimated ratio of tax expense to real estate value on cash-rented farms, 1923–1928, in the 4 districts of the State; (3) the estimated relationship of real estate taxes and owner's income on cash-rented farms for the State by years, 1900–1928, and by districts, 1928; (4) for selected owner-operated farms, as shown by an analysis of 2,627 farm accounts kept from 1914 to 1927, the relationship of property taxes to farm business for the period 1924–1927, the frequency distribution of individual farms classified by the percentage of farm income required for taxes, 1914–1917 and 1924–1927, and by years 1914–1927, and classified by the percentage of labor income required for taxes, 1918–19 and 1927; (5) the relation, 1926–27, of taxes to farm income on farms classified by size of income; (6) the ratio by years, 1923–1928, of tax valuation to sales price of farm real estate and of the 1925 census to the 1927 tax valuation of livestock on 1,029 farms in 10 counties; and (7) the distribution of the total assessed and estimated true valuations of personal property, buildings, and land on Ohio farms and the frequency distribution of assessed valuations as measured by sales value on 1,599 farms. Other tables give data as to the effects of productivity of land, improvements, type of road, and distance to market on sales price and tax valuation on 340 farms sold in 1927 and 1928; the distribution of assessments on land and buildings in 1926 in rural townships and in incorporated territory; and the amount and increase of delinquent taxes on all real estate of the State and on all real estate in 88 rural townships in selected years, 1912–1928.

Farm taxes in terms of gross cash income were 60 per cent higher in 1928 than in 1913. The average property taxes and assessments for the period 1921–1928 were 12.60 per cent of the gross cash, 20.57 per cent of the net cash, or 12.62 per cent of the total net agricultural income of Ohio farmers. Other taxes took about 2 per cent of the total net income. Property taxes on cash-rented farms took 17.08 per cent of the estimated net rent in 1900 and 38.44 per cent in 1928, the percentages in 1928 varying from 31.56 in the southeastern district to 61.02 in the northeastern district of the State. The farm accounts of the owner-operated farms showed that the percentages of farm income taken by taxes in 1914 were first quartile 6.09, median 8.20, and third quartile 11.45. In 1927 the percentages were 9.03, 12.93, and 18.04, respectively. In 1926 and 1927 the taxes on farms with incomes of from $500 to $999 averaged $150, and on those with incomes of from $4,000 to $4,499, $335. After the 1925 reappraisement the range of assessment on 1,599 farms studied was from less than 20 to over 175 per cent of the sales price, one-half of these assessments

ranging from 69 to 102 per cent of the sales price. Real estate tax delinquency was found to have increased greatly, but the 88 selected rural sections showed a slower rate of increase than did the State as a whole.

The Missouri farmers' tax position, C. H. HAMMAR (*Missouri Sta. Bul. 291 (1930), pp. 28, figs. 4*).—This bulletin was prepared to amplify and show the foundation of the statements on farm taxation in the report of the State Survey Commission recently submitted to the Governor of Missouri. Indexes of farm taxes and incomes, the relation of taxes and cash rents and of taxes and land values, tax delinquency, the farmer as a tax payer and the farmer's ability to pay taxes, and farm taxes and benefits are discussed, using as a basis data collected in studies made by individuals and institutions in Missouri and other States.

A brief analysis is made of the specific proposals of the survey commission for changes in the system of taxation of the State.

The cost of developing an apple orchard, C. W. ELLENWOOD (*Ohio Sta. Bul. 456 (1930), pp. 30, figs. 7*).—This bulletin discusses the costs and yields through the first 15 years (1915–1929) of a 1.35-acre unit of the orchard of the station. The unit included 24 Stayman and 24 Delicious trees. Twelve trees of each variety were in a grass mulch plat and 12 in a cover crop plat, and comparisons are made on the basis of variety and culture method.

"The cost of production under both systems of management for the 15-year period was a trifle less than 2 cts. per pound. The average cost of production per bushel (48 lbs.), excluding the package, for the seven-year period 1923–1929, was 80.2 cts. on the cover crop plat and 81.2 cts. on the grass mulch plat. Spraying represented the largest item of cost per bushel, with interest and taxes ranking second.

"Stayman came into profitable production much earlier than Delicious and in the first 15 years yielded much more fruit per tree. Delicious proved more resistant to root rot, due to improper soil drainage, than did Stayman.

"The trees on the grass mulch plat came into bearing earlier than those on the cover crop plat. Income first exceeded cost of production on the grass mulch plat during the ninth year and on the cover crop plat during the tenth year. At the end of 15 years there was no significant difference in the size of the trees on the two plats.

"The total yield of fruit was higher and the cost of production per pound lower on the cover crop plat than on the grass mulch plat. The method of culture had no effect on the average date of full bloom, nor on the color of fruit. . . .

"Maximum economy in the grass mulch system is attained only by the use of inexpensive mulch material or by growing the mulch in the orchard. The grass mulch system must be supplemented by the use of nitrogenous fertilizers. The addition of phosphorus is regularly recommended to promote growth of mulching material.

"High quality fruit and regular and heavy production were as important in economic production in this orchard as cost of operation."

Growing and marketing grapes in Erie County, Pennsylvania, J. T. VANDENBURG, JR., and G. P. SCOVILLE (*Pennsylvania Sta. Bul. 260 (1930), pp. 40, figs. 11*).—This bulletin summarizes the data obtained in Erie County, Pa., in an economic study of the grape-growing industry made by the Bureau of Agricultural Economics, U. S. D. A., in cooperation with the Pennsylvania State College, Cornell University, University of Arkansas, and Michigan State College. It is based on records obtained during May and June, 1929, from 102 farms with 5 acres or more in grapes. Tables are included and discussed showing

the costs of production and marketing and the relation of age of vineyard, number of bearing vines per acre, training systems, soil improvement and tillage practices, use of horses or tractors, methods of hauling and selling, size of farms, etc., to yields, costs, and returns.

Age of mature vineyards had practically no effect on yield or cost of production. Lake plain farms had much better yields than hill farms. The umbrella and the Chautauqua arm systems of training required less time and cost less than the Kniffen system, but yields were about the same for all three systems. Use of commercial fertilizer gave better results on the lighter soils, grapes being produced more economically on the lighter soils with about $7 worth of fertilizer and on the heavier soils with no fertilizer. The cost of production on both types of soil was highest where fertilizer worth $10 or more per acre was used. On the average, the use of tractors paid on farms with over 50 acres in crops. Vineyards plowed, disked, and harrowed 8 times during the season yielded better than those tilled only 5 times. Horse hoeing more than once and more than a minimum of hand hoeing did not increase yields. Hauling from the farm was less with trucks than with horses. Truck shipments realized the highest prices, and the returns per hour of man labor were greatest when over 50 per cent of the grape crop was sold by truck. The average prices received for carload shipments through the cooperative were slightly better than the average of other car shipments, and growers selling to the juice factory received less per hour of man labor than those selling in other ways. Cost of production was less on the larger farms, there being less hours of man labor per acre and a smaller charge for the use of farm power and equipment.

The motor truck as a carrier of fruits and vegetables to greater New York, B. M. Price (*New Jersey Stas. Bul. 503 (1930), pp. 88, figs. 5*).—This study was made in cooperation with the U. S. Department of Agriculture and the New Jersey State Department of Agriculture. Data regarding daily motor truck receipts of fruits and vegetables by wholesale and jobbing dealers of New York City and Newark, N. J., were furnished by the Bureau of Agricultural Economics, U. S. D. A.; regarding daily receipts in the two municipal farmers' markets of New York City from the New York City Department of Markets; and regarding the Newark Farmers' Market from the New Jersey State Department of Agriculture. Through mailed schedules or interviews, information was obtained from 521 farmers trading in the four farmers' markets of New York City and Newark and from 768 growers, 94 commercial truckmen, and 107 shipping point dealers. Four of the largest receivers of motor truck shipments in Washington Market, New York City, furnished data as to transportation costs, commodity specialization of commission men, and buying by dealers in definite areas, and 16 representative wholesale dealers and jobbers in the same market were interviewed as to their views relative to the use of the motor truck for produce shipments.

Tables with explanatory text are given showing by months the receipts in farmers' markets, April to October, 1929, and in jobbers' markets, August, 1928, to July, 1929, and the receipts in jobbers' markets by source of production. The advantages and disadvantages of the use of the motor truck, the costs of transportation and marketing by rail, truck, express, boat, and parcel post; the terminal conditions and requirements; and the effect of the use of motor trucks on immediate marketing outlets for producers, marketing methods of country dealers, associations, and exchanges, selling at the farm, commission men, and the stability of markets are discussed.

Approximately 14 per cent of the fruit and vegetable supply of New York City, August 1, 1928, to July 31, 1929, was received by motor truck. Farmers'

market receipts were produced mostly within 50 miles of the market, the average distance produce was trucked being 29 miles. Fruits and vegetables trucked to the jobbing markets were hauled on an average of 100 miles. Of the receipts on the jobbing markets from the 10 States in the New York motor truck area, 32 per cent came by truck. Estimates of growers indicated that 73 per cent of the fruits and vegetables from New Jersey, eastern New York, and Long Island were shipped by truck.

Some factors affecting the movement of Ohio wheat, L. G. FOSTER (*Ohio Sta. Bul. 458 (1930), pp. 48, figs. 21*).—Carload shipments for the crop years (July 1–June 30) 1924–25 to 1928–29 were used as the basis of this study, the data being secured from the records and by personal interviews with officials of over 150 private and farmer elevators and from track buyers. Data regarding intermarket movement and quality of wheat were furnished by the Chicago, Toledo, and Cincinnati offices of the Bureau of Agricultural Economics, U. S. D. A. The quality of and trends in the production of Ohio wheat, manufacturing requirements of Ohio mills, marketing machinery, method of purchase, grade requirements, storage, selling practices, freight rates to the East, South, and Southeast, the proportional or reshipping and milling in transit privileges, terminal markets, distribution of shipments, seasonal movement of wheat, and the factors influencing the choice of markets are discussed.

The test weight per bushel was the ordinary basis for purchasing wheat, but there was no uniform method for arriving at prices for grades above or below No. 2, and variations in discounts on the same grade often equaled 50 per cent of the margin possible for the local elevator to take. On the average, storage from August to February would have netted 6.5 cts. per bushel increase in price. Ohio country elevators shipped about 45 per cent of their wheat in July and August, and the remainder was moved rather uniformly during the other 10 months. Cash bids of buyers in the same market area were found to be quite uniform, but those of buyers in different areas showed a wide variation at times.

The world wheat outlook, 1930, and facts that farmers should consider (*U. S. Dept. Agr., Misc. Pub. 95 (1930), pp. II+40, figs. 35*).—An outlook statement is made regarding the 1930 world wheat outlook, and the following phases relative to the outlook are discussed: The trend of wheat prices, the general price level, world supply and price, consumption of wheat, the European demand for wheat, trend of world wheat production, trend of wheat acreage, expansion of acreage into new territory, Russia as a factor in the world wheat situation, the tractor in wheat production, the increasing use of combine-harvesters, factors affecting the price of wheat, relation of prices in the United States to world markets, the effect of changes in production upon prices, and the position of the soft red winter wheat producer.

Included also is the report of the conference on adjustments in the hard winter wheat area of the United States, held at Manhattan, Kans., in June, 1930, and attended by representatives of this Department, the Federal Farm Board, and the State agricultural colleges, experiment stations, and extension services of Kansas, Nebraska, Colorado, Oklahoma, and Texas.

Quality as a factor in the price of Kentucky lambs, E. C. JOHNSON and C. D. PHILLIPS (*Kentucky Sta. Bul. 302 (1930), pp. 91–122, figs. 15*).—Data were obtained from the sales records of 9 local stockyards in 1927 and 10 in 1928 and from representative firms at the terminal markets in Louisville, Ky., and Cincinnati, Ohio.

Prices were found to rise as weight increased up to approximately 70 lbs. and to decrease again above about 80 lbs. The weekly average prices per 100 lbs.

for ewes and wethers were higher than those for ewes and bucks during the two years as follows: Last week of May, 6 and 20 cts.; June, 64 and 77 cts.; July, 78 and 95 cts.; August, $1.24 and $1.38; and September, $1.30 and $1.41. The average prices per 100 lbs. of different grades of ewes and wethers compared with those of the choice grades were for prime +31 cts. in 1927 and +45 cts. in 1928; good (73 to 82 lbs.) —30 and —72 cts.; good (below 73 lbs.) —83 cts. and —$1.84; fair (73 to 82 lbs.) —$1.62 and —$1.90; fair (below 73 lbs.) —$2.22 and —$2.45; and common —$2.98 and —$3.52. For different grades of ewe and buck lambs compared with such lambs of good quality, the differentials in 1927 were, fair (73 to 82 lbs.) —94 cts.; fair (below 73 lbs.) —$1.42; fair (above 83 lbs.) —$1.49; and common —$3.15. Of the total receipts of ewe and wether lambs at local markets in 1928, 3 per cent were prime, 18 per cent choice, 36 per cent good (73 to 82 lbs.), 5 per cent good (below 73 lbs.), 11 per cent fair (73 to 82 lbs.), 14 per cent fair (below 73 lbs.), and 13 per cent common.

Crops and Markets, [September, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 9, pp. 321–376, figs. 4*).—Tables, graphs, reports, summaries, and notes are included regarding cold storage holdings, crops, livestock and livestock products, dairy and poultry products, feedstuffs, fruits and vegetables, grains, hay, seeds, and the prices of agricultural products, together with special reports, tables, and articles on the 1930 midsummer cattle outlook; the farm value, gross income, and cash income from farm production, by States, 1928 and 1929; the income from farm production in the United States, by calendar years 1924–1929; farmers' intentions to sow winter wheat and rye as of August 15, 1930, and the relation of such intentions to the outlook for the 1931 crop; and the feed situation in the United States on August 20, 1930.

The consumption of dairy products in six New Jersey townships, W. C. Waite and C. B. Howe (*New Jersey Stas. Bul. 506 (1930), pp. 47, figs. 6*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., with a view to determining the consumption of fluid milk, cream, butter, cheese, and other dairy products by rural people in areas representative of different types of agriculture in the State, and to analyzing the factors responsible for the variations in consumption. The data used were from 1,391 questionnaires obtained by enumerators. The per capita consumption of milk, cream, butter, cheese, and condensed and evaporated milk by the families with and without cows and by families of different sizes and composition in the six townships is shown in tables and discussed. The effects of income and nationality on per capita consumption of dairy products are also discussed.

Possession of cows led to about a doubling of fluid-milk consumption. Families with cows but not selling milk consumed larger quantities of fluid milk, butter, and cottage cheese than did other groups. Consumption of fluid milk by the group without cows was influenced by the per capita production in the township, but manufactured dairy products showed no such influence. Families with children used more fluid milk and a larger portion of it for drinking than did those composed of adults alone. Per capita consumption of all dairy products declined as the per capita income decreased.

The second part of the bulletin (pp. 28–47) is devoted to a discussion of the reliability of the results obtained in the study, special consideration being given to the use of the questionnaire method in such a survey.

Cost of living and population trends in Laurel County, Kentucky, M. Oyler (*Kentucky Sta. Bul. 301 (1930), pp. 65–90, figs. 4*).—Tables with explanatory text are included showing for the 203 families covered in the study noted above the value of items of family living purchased and furnished by

the farm, the families being classified by size of crop acreage grown, by total value of family living, and by size of family and the number of rooms per house and extent of modern equipment. The social relationships of the families, age and birthplace of operators and home makers, number of children by sex and age groups, education of children and age of leaving home, marital status, occupation, etc., of children away from home are also discussed. Other tables present data as to population changes in the county, 1850–1920, the age and sex distribution of population in 1918 and 1928, and the changes in the number of houses occupied and vacant by years, 1918–1928.

This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

The negro church in rural Virginia, C. H. Hamilton and J. M. Ellison (*Virginia Sta. Bul. 273 (1930), pp. 40, figs. 8*).—This bulletin is the third of the series previously noted (E. S. R., 57, p. 787; 62, p. 185) and makes an analysis of the distinctive problems of the negro church in the State. It is based upon a special tabulation of the 1926 U. S. Census of Religious Bodies and case studies of negro churches and communities in 9 counties of the State. The subject is dealt with under the following headings: Membership strength, over-churching, financial support, ministers and leaders, the young people's problem, church services and activities, and the church and rural organizations. A successful rural negro church is described. Suggestions and recommendations are made of possible ways of solving, in part at least, some of the existing problems of the negro church.

FOODS—HUMAN NUTRITION

French cooking for American kitchens, M. T. and L. Bonney (*New York: Robert M. McBride & Co., 1929, pp. XV+295, pls. 15*).—A collection of French recipes interspersed with general directions for the preparation of foods according to French customs.

Rabbit recipes, F. W. Yeatman and M. C. Stienbarger (*U. S. Dept. Agr. Leaflet 66 (1930), pp. 8, figs. 6*).—This collection of recipes for cooking domestic rabbits includes broiled, fried, and smothered rabbit, rabbit en casserole, rabbit chop suey, rabbit pie, rabbit liver paste, rabbit salad, and rabbit a la king.

Successful canning and preserving, O. P. Malcolm (*Philadelphia and London: J. B. Lippincott Co., 1930, 4. ed., rev., pp. XV+663, pls. 6, figs. 297*).—The principal changes in the present revision of this volume, earlier editions of which have been noted (E. S. R., 39, p. 716), consist in the addition of new material on the crystallization of fruits and melons and the conservation of nuts. Other chapters have been brought up to date and additions have been made to the bibliography.

The interconversion of the major foodstuffs, D. Rapport (*Physiol. Rev., 10 (1930), No. 3, pp. 349–472*).—This is an extensive review and discussion of the literature dealing with the synthesis of proteins and the conversion of proteins to fat and carbohydrate, of carbohydrate to fat, and of fat to carbohydrate. An extensive classified bibliography is appended.

Buffer capacities of various milks and proprietary infant foods, G. E. Holm and B. H. Webb (*Amer. Jour. Diseases Children, 40 (1930), No. 2, pp. 260–268, figs. 5*).—In this investigation, conducted at the Bureau of Dairy Industry, U. S. D. A., an attempt was made to evaluate quantitatively the buffer intensities of various milks and infant foods over the range of H-ion concentration concerned in digestion.

Buffer intensity curves at various ranges of H-ion concentration were plotted from titration data on one sample of goat's milk, four of cow's milk differing

in their content of solids-not-fat, and two samples of breast milk drawn at different periods following parturition. The results indicate that practically the entire acid buffering in milks occurred in the range of from pH 5 to 6, and that there were considerable differences in the various milks in the amounts of acid required to produce an H-ion concentration of pH 5.

Five samples of proprietary infant foods were reconstituted as directed on the labels of their containers and titrated with N/5 HCl as in the case of the milk samples. Samples of an undiluted lactic acid milk, breast milk, and cow's milk diluted 1 : 1 were similarly titrated. With the exception of the lactic acid milk and one of the proprietary foods the titration curves ran more or less parallel with that of diluted cow's milk. Of the buffer intensities calculated from these titrations only those of breast milk and the proprietary food differing from the others in its titration curve had buffer intensities less than those of the diluted cow's milk.

The relative values of the buffer capacities as determined by the average buffer intensities of each sample between its initial H-ion concentration and that of pH 4 gave values approximately the same as diluted cow's milk in the case of two samples and higher for two other samples. Only one sample approached breast milk in its buffer capacity.

Buffer intensity curves were also determined of two samples of normal, unsterilized milk and the corresponding reconstituted evaporated and sterilized products. Although sterilization caused a shifting of the regions of maximum buffer intensity, the average buffer intensities or buffer capacities were all of approximately the same magnitude.

The *acid coagulation tests* on the various samples of milk and proprietary foods showed differences which were considered to have no direct correlation with buffer capacity.

The various observations are considered to indicate that "in the majority of cases of infant feeding the nature of the curds formed is of greater importance than is the buffer capacity."

Co-ordinative bio-chemistry of the cell and tissues.—Lecture I, "Cell surfaces." Lecture II, "The ministers of metabolic change." Lecture III, Tissue anarchy, R. A. PETERS (*Jour. State Med., 37 (1929), No. 12, pp. 683–709, figs. 6; 38 (1930), Nos. 1, pp. 3–30, figs. 6; 2, pp. 63–87, figs.* [6]).—In this series of three lectures delivered before The Royal Institute of Public Health, Great Britain, the author presents his theories concerning the processes by which biochemical coordination in the cell is effected, and discusses recent research on the various factors constituting the vitamin B complex, particularly contributions from his own laboratory pointing to the possibility that these factors are coordinating factors associated with the metabolism of carbohydrate, water, fat, and protein.

The rôle of the small intestine in nutrition, H. E. MAGEE (*Physiol. Rev., 10 (1930), No. 3, pp. 473–505*).—In this critical review attention is given mainly to absorption from the intestines (1) in relation to the structures in the intestinal wall—the epithelium, the capillaries and lymphatics, the villi, the musculature, and the nerves and (2) as affected by the action of the ductless glands and by the composition of the diet, particularly the balance of its various constituents. A brief discussion is included of various methods employed in investigating intestinal absorption. An extensive bibliography is appended.

The influence of feeding on certain acids in the feces of infants.—V, Clinical considerations, J. R. GERSTLEY (*Amer. Jour. Diseases Children, 40 (1930), No. 1, pp. 27–45, figs. 8*).—In this paper, read at a meeting of the Chi-

cago Society of Internal Medicine, December 16, 1929, the author first reviews briefly the literature of the past 20 years dealing with nutritional disturbances in infants. Attention is called to two schools of thought concerning the causes of such disturbances. "One school, championed by the majority of observers, believes that the primary causes of nutritional disturbance are gastric or intestinal indigestion, with diarrhea usually due to the irritation of acids resulting from carbohydrate fermentation. The other school, championed by Finkelstein, believes that cow's milk causes a primary disturbance of metabolism, and that incidental to this disturbance there is an increased fermentation of carbohydrate in the intestine resulting in a complicating but purely incidental diarrhea."

The chemical studies of the author and his associates, reported in the previous papers of the series, are then reviewed with reference to the two theories, with the conclusion that "diarrheal disease in infancy is not due primarily to the indigestibility of cow's milk, but rather to the effect of cow's milk on the general body metabolism and nutrition with intestinal involvement as a secondary complication. The severest disturbances occur when a parenteral infection complicates such a disturbance of metabolism."

***Nutrition of children on a mixed and on a vegetable diet*, D. E. Lane** and F. H. Bosshardt (*Amer. Jour. Diseases Children*, *40* (*1930*), *No. 2*, *pp. 285–297*).—Following a discussion of the advantages and disadvantages of milk as a food, with a review of the literature reporting favorable results on vegetable diets or ordinary diets supplemented with fruits and fruit juices, the authors report upon a 10 weeks' demonstration conducted on two groups of children from 7 to 15 years of age in an orphanage in Oakland, Calif. One group of 14 received the regular orphanage diet supplemented with milk to the equivalent of a quart a day for each child and with additional fruits and vegetables. The experimental group of 11 children received no milk, cream, cheese, eggs, or meat, but instead almonds, wheat germ, figs, and peanut butter. For both groups the vegetables included much raw cabbage, lettuce, and carrots and considerable amounts of cooked string beans and the fruits, stewed peaches, apricots, raisins, cooked and raw apples, and a good quantity of bananas and tomatoes. Each child in the control milk group had an orange a day and in the other group three cups of orange juice. The diets furnished about 1,750 calories per child per day, with protein to the extent of 10 per cent of the calories. The calcium intake of the control group averaged 1 gm. a day and of the experimental 0.65 gm. for each child. Cod-liver oil was given to 7 children in the control group and 6 in the experimental group. Measurements taken at the beginning and end of the experimental period included weight and height, with calculations for under- and overweight, hemoglobin, alveolar CO_2, hand grip, chest circumference, chest expansion, and urinary pH.

With respect to the average changes in the two groups, the experimental group showed slightly greater increase in height and weight and in chest circumference and expansion, a decidedly greater increase in hemoglobin, and a change in urinary pH from minus to plus. The other values were practically the same for the two groups.

"From the results of this short feeding test there appears no reason to conclude that a scientifically balanced milk diet, including 1½ pints to 1 qt. of milk a day per child, produces greater growth or better health in growing children from 7 to 15 years old than a scientifically chosen vegetable diet furnishing a smaller amount of calcium. If there is a greater calcium storage on the milk diet than on the vegetable diet, a supposition which does not appear justified by the gains in height and weight or the other data here

presented, there still would seem to be no reason for assuming such excessive storage advantageous for the general health of growing children. Excessive calcium storage may possibly obscure a clear perception of the function of other factors in the diet, whether it be that of the calorie-producing nutrients, the various minerals and vitamins, or the acid-base equilibrium of the blood."

Nitrogen metabolism of children, with special reference to the protein requirement of children of preschool age, J. P. PARSONS (*Amer. Jour. Diseases Children, 39 (1930), No. 6, pp. 1221-1239, figs. 8*).—In an effort to determine whether children can maintain a positive nitrogen balance on less than 2.2 gm. of protein per kilogram of body weight (1 gm. per pound), protein metabolism experiments were conducted on three normal children of preschool age living at home and two diabetic children 12 and 4 years of age, respectively.

The required calories were calculated from the Pirquet nem formula and the diets at first made up to contain 2.2 gm. of protein per kilogram of body weight. Later when positive balances were assured, the protein was lowered and the metabolism experiment continued.

Two of the three normal children were able to maintain positive nitrogen balances on 1.27 and 1.32 gm. per kilogram, respectively. The third developed a respiratory infection and went into negative nitrogen balance before the protein had been lowered below 2.2 gm. The older diabetic patient went into negative nitrogen balance when the protein was lowered to 1.65 gm. per kilogram. The other at one time during the experimental period showed a positive nitrogen balance on 1.18 gm. of protein.

In discussing the significance of these results, the author concludes that a healthy child from 4 to 8 years of age can maintain a positive nitrogen balance on 0.5 gm. per pound, or 1.1 gm. per kilogram body weight, and that with insulin a diabetic child can maintain a nitrogen balance and make normal development on 1 gm. of protein per pound. or 2.2 gm. per kilogram. It is considered that in order to maintain the nitrogen balance on a minimum protein intake it is necessary to replace the withrawn protein by an isodynamic equivalent of carbohydrate or fat.

Studies of the metabolism of women.—IV, The calcium and inorganic phosphorus in the blood of normal women at the various stages of the monthly cycle, R. OKEY, J. M. STEWART, and M. L. GREENWOOD (*Jour. Biol. Chem., 87 (1930), No. 1, pp. 91-102, fig. 1*).—Continuing the investigation noted previously (E. S. R., 57, p. 91), determinations of the calcium and phosphorus in the blood serum of 12 normal young women were made three times a week for periods averaging five weeks each in order to determine possible alterations in the metabolism of these elements during the monthly cycle.

The data, tabulated by individuals, showed no very marked or consistent variations in the serum calcium at any phase of the monthly cycle. There appeared to be a tendency toward lower values for calcium a few days previous to, and higher values from the eighth to the fifteenth day following, the onset of menstruation. The variations in serum phosphorus, while less consistent, showed a tendency to low values at about the eighth to the tenth day preceding the onset of menstruation and increases at about the fourth to the sixth day of the menstrual period.

A series of calcium determinations at two- or three-day intervals on the blood serum of six male subjects showed smaller day to day variations than in the women.

Human milk flow, I. G. MACY, H. A. HUNSCHER, E. DONELSON, and B. NIMS (*Amer. Jour. Diseases Children, 39 (1930), No. 6, pp. 1186-1204, figs. 10*).—This

report deals with the hourly, daily, and monthly fluctuations in the secretion of milk during two successive lactation periods in each of the three subjects of the metabolism investigation noted previously (E. S. R., 63, p. 488), and with the total milk production of one of the subjects in both lactation periods and of the other two in one period during which the total milk supply was expressed manually, thus avoiding any effect of the suckling reflex.

There were marked variations in the quantity of milk secreted by the individual women from day to day and in the output from week to week, but with a tendency toward a gradual increase in output as lactation progressed up to a certain level, beyond which the output remained at high levels for several weeks. The average daily output of milk from the sixth week through the fourteenth month was 2,602 cc. for one subject in the first of the two lactation periods studied and 3,134 cc. in the second. The other two subjects had a total output of 2,366 and 1,419 cc. daily, respectively, during the single lactation period reported. The total production for the entire lactation periods was 1,067.3 and 1,454.5 liters, respectively, for the first subject, 1,060.1 for the second, and 590.9 for the third.

Complete removal of the milk from the breasts at regular intervals increased the output. In two of the subjects the left breasts were larger than the right and secreted more milk, while in the other the reverse was true.

Factors influencing the distribution and character of adipose tissue in the rat, I, II (*Jour. Biol. Chem., 87 (1930), No. 1, pp. 147–174, figs. 6*).—This investigation is reported in two parts as follows:

Part I. *The influence of diet, weight, and sex upon the distribution of fat*, F. Yamaguchi, W. E. Anderson, and L. B. Mendel (pp. 148–155).—Groups of rats were fed food mixtures equicalorically rich in fat (Crisco, soybean oil, or mutton tallow) or in carbohydrate (cornstarch). The diets, which approximated the high fat and high carbohydrate diets of Smith and Carey (E. S. R., 51, p. 263), furnished a total energy intake of 1,300 calories, of which 83 per cent was supplied by the fat or carbohydrate. The feeding, which was begun when the rats were 21 days old and weighed about 40 gm. each, was continued until different groups had reached the weights of 50, 150, and 250 gm. At the end of the experiment the rats were killed and the fat obtained from six different storage depots—intermuscular, genital, subcutaneous, perirenal, mesenteric, and omental. The various portions were saponified and the fatty acids liberated with concentrated hydrochloric acid, extracted with ether, and dried to constant weight.

Approximately twice as much total fat was deposited by the rats on the diets rich in fat as by those on the carbohydrate-rich diet. The proportionate distribution of the stored fat was similar for rats of the same sex and weight regardless of the type of diet. With increase in body weight rats of both sexes showed an increase in the stored fat proportional to the body weight. The percentage of subcutaneous fat was largest in the group of small rats. In the 250-gm. group the male rats stored more fat in the perirenal depot and the females in the genital depot.

Part II. *The influence of diet, undernutrition, fasting, and activity upon the distribution and character of fat*, L. L. Reed, W. E. Anderson, and L. B. Mendel (pp. 156–174).—In this part the diets were designed to supply in constant proportion the necessary protein, salts, and vitamins, with starch, soybean oil, or coconut oil to the extent of 60 per cent of the total calories as the source of body fat. Female rats from 35 to 45 gm. in weight were fed these diets under various conditions of activity and inactivity and of limited and unlimited calories until they weighed 180 gm., after which they were killed, with the

exception of certain groups which were given vitamins and water alone until their body weight had decreased 30 per cent. The fats in the various organs were removed and determined in general as in the preceding part. Iodine values were also obtained to determine the portion of saturated and unsaturated fatty acids.

The distribution of the fat was independent of the type of diet fed and was not changed under any of the observed conditions except forced exercise, voluntary running at night, and undernutrition. The forced activity and nocturnal activity increased the proportion of intermuscular fat and the forced activity and undernutrition caused a decrease in the proportion of genital fat. The degree of saturation of the stored fat was dependent upon the diet of the rat, but was not changed through activity or the amount of food or the location. A single exception was the group of rats on coconut oil fasted until their body weight decreased 30 per cent. These were depleted of a greater proportion of fat than any of the other fasted rats, and the fat which was present had a slightly higher iodine number than the stored fat of any of the other rats on the diet.

Carotin and the growth of animals [trans. title], M. Javillier (*Bul. Soc. Chim. Biol., 12 (1930), No. 5, pp. 554–578*).—In this lecture the author reviews critically the recent conflicting literature on the relation to vitamin A of carotin and of biosterin, the concentrate prepared from cod-liver oil by the Takahashi method (E. S. R., 55, p. 593). In attempting to reconcile the various findings, the possibility is suggested that neither carotin nor biosterin is vitamin A but that both are capable of adsorbing the vitamin, or that there are several substances capable of giving vitamin A tests on account of containing the same active group.

A bibliography of 68 titles is appended.

Studies on the food value of fresh grape juice and of wine from the point of view of their content of vitamins [trans. title], L. Randoin (*Rev. Vitic., 72 (1930), No. 1871, pp. 381–389*).—A few feeding experiments on guinea pigs and pigeons are reported from which the author concludes that freshly pressed grape juice contains an appreciable amount of vitamin C, but very little vitamin B. Doses of 6 cc. daily kept guinea pigs alive for 70 days when fed as the sole source of vitamin C, while in the pigeon experiments the survival period on 12 cc. was only slightly longer than on the basal diet alone.

An anemia of dogs produced by feeding onions, W. H. Sebrell (*Pub. Health Rpts. [U. S.], 45 (1930), No. 21, pp. 1175–1191, figs. 7*).—In the course of a study of the blacktongue preventive properties of onions, it was observed that the experimental animals on the basal diet supplemented with onions were all suffering from anemia. This led to a series of blood studies on dogs fed the basal diet with varying amounts of onions, raw and cooked. Severe anemia was always produced when onions, either cooked or raw, were fed in quantities of 15 gm. or over per kilogram of body weight per day.

A study of the blacktongue preventive value of lard, salt pork, dried green peas, and canned haddock, J. Goldberger, G. A. Wheeler, L. M. Rogers, and W. H. Sebrell (*Pub. Health Rpts. [U. S.], 45 (1930), No. 23, pp. 1297–1308*).—Continuing their study of the effectiveness of various foods in the prevention of blacktongue in dogs and presumably pellagra in man (E. S. R., 63, p. 491), the authors have found lard and salt pork to be poor sources, dried green peas to contain relatively small amounts, and haddock slightly more of the preventive substance. Fifty per cent or more of the test animals on the lard, salt pork, and haddock diets showed post-mortem evidence of fatty degeneration of the liver as described by Sebrell (E. S. R., 62, p. 695).

TEXTILES AND CLOTHING

Ensembles for sunny days, C. L. Scott (*U. S. Dept. Agr. Leaflet 63 (1930), pp. 4, figs. 4*).—The ensembles for little boys and girls described and illustrated in this leaflet of the series noted previously (E. S. R., 62, p. 298), consist of romper suits with net waists, and overblouses or dresses to match the lower part of the rompers. "Sun-suit ensembles are not only convenient and comfortable; they are healthful. Advantage may be taken of the sunlight at any time and the outer garment may be put on quickly when needed. Energy needed for growth is not wasted by allowing the child to become either too warm or chilly."

HOME MANAGEMENT AND EQUIPMENT

Fuels used for cooking purposes in Indiana rural homes, M. Rapp (*Indiana Sta. Bul. 339 (1930), pp. 32, figs. 14*).—The results of a questionnaire survey of fuels used for farm cooking in Indiana are reported, indicating that coal, wood, and kerosene are the most important. Laboratory studies as to the percentage of efficiency with surface burners have been noted (E. S. R., 63, p. 597).

In the preparation of a meal using different methods for cooking, with all fuels used there was little difference in the amount of fuel required in cooking by means of the oven or by means of surface burners. The use of a pressure cooker or of a waterless cooker in the preparation of the meal saved an appreciable amount of fuel as compared with other methods. With the coal stove the saving in fuel with the use of these cookers was considerably less than with kerosene, gasoline, and electric stoves. The use of insulated electric cookers resulted in a saving of more than 60 per cent in the amount of electricity consumed as compared with the amount consumed when using oven or surface burner methods.

From the standpoint of cleanliness, control of heat, and comfort or use in summer months, electricity was shown to be a most desirable cooking fuel for farm use. While the cost of operating electric stoves, with the cooking rates now available in many Indiana rural communities, was shown to be slightly higher than with other cooking fuels, this study seems to indicate that the higher operating cost with electricity was compensated by a most appreciable saving in the time required in care and cleaning of stoves.

Window curtaining, B. M. Viemont (*U. S. Dept. Agr., Farmers' Bul. 1633 (1930) pp. II+30, figs. 25*).—A revision of Farmers' Bulletin 1516 (E. S. R., 56, p. 298).

MISCELLANEOUS

Report on the agricultural experiment stations, 1929, W. H. Beal, H. M. Steece, et al. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1929, pp. 100*).—This report includes a discussion of the activities of the stations during the fiscal year ended June 30, 1929; a résumé (pp. 17–73) entitled Results of Station Work, containing summaries by H. C. Waterman, H. M. Steece, J. W. Wellington, W. A. Hooker, H. W. Marston, S. L. Smith, R. W. Trullinger, and B. Youngblood; a list classified by subjects of the publications of the stations received during the year; and Income, Expenditures, and Other Statistics, 1929, by J. I. Schulte (pp. 91–100).

The United States Department of Agriculture: Its growth, structure, and functions, M. S. Eisenhower and A. P. Chew (*U. S. Dept. Agr., Misc. Pub. 88 (1930), pp. IV+147, figs. 21*).—This publication describes and depicts graphically the organization and work of the Department as a whole and of its bureaus and offices in turn.

NOTES

California University.—A survey of the relationships of the Federal, State, and local governments in the agricultural activities of the State is to be carried on by the bureau of public administration of the department of political science with funds provided by the Rockefeller Foundation. In connection with this survey, Dr. Carleton R. Ball has been appointed research associate, effective January 1.

Michigan College and Station.—Alfred Knight Chittenden, head of the department of forestry since 1914, died November 1, 1930, at the age of 51 years.

Prof. Chittenden was born in New Haven, Conn., and was graduated in 1900 from the Sheffield Scientific School of Yale University as a civil engineer and in 1902 from the School of Forestry. After a year spent in studying forest conditions in Europe, he entered the U. S. D. A. Forest Service in 1907 and transferred to the Indian Service in 1911. He was the author of numerous station bulletins and other publications.

New Jersey Stations.—The Cook-Voorhees Soil Science Foundation, established with a gift by Director J. G. Lipman of $1,250, received by him as the Chilean nitrate award of 1928, has now been increased by other individuals, graduate students of the College of Agriculture, and four State associations to nearly $25,000. Dr. F. H. Hesselink von Suchtelen of the University of Munich has been appointed as the first fellow under the foundation, and it is expected that he will devote a year to a study of energy transformations accompanying the decomposition of organic matter in the soil.

Pennsylvania College and Station.—A recent issue of *Pennsylvania State Farmer* announces that Helgi B. Josephson, associate professor of farm machinery and research engineer, was drowned near Hamburg, Germany, in October, 1930. He was born at Baldur, Manitoba, September 10, 1895, graduated from the University of Saskatchewan in 1922, and served as instructor in agricultural engineering in that university from 1922 to 1924. He received the M. S. degree from the Iowa College in 1925 and came to Pennsylvania as assistant professor in the same year.

Wisconsin University and Station.—Chris. L. Christensen, executive secretary of the Federal Farm Board, has been appointed dean of the College of Agriculture and director of the station.

Fruit Studies at East Malling.—The Horticultural Research Station at East Malling, Kent, England, has been recently made the headquarters of the Imperial Bureau of Fruit Production and enlarged to provide facilities for the study of all aspects of fruit growing under temperate conditions. What is said to be the largest cold storage plant in existence, known as the Ditton Laboratory, has been opened for research into fruit storage. This plant contains a "model ship's hold" with a capacity of 120 tons of apples. Provision has also been made for accommodating six graduate students from the Dominions. The project is financed by the Empire Marketing Board.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 6, the following section officers were elected at the Washington meeting, November 17–19, 1930: Agriculture, Cornelius Betten of Cornell University, chairman, B. H. Crocheron of California, vice chairman, and R. Y. Winters of North Carolina, secretary; engineering,

W. N. Gladson of Arkansas, chairman, and Paul Cloke of Maine, secretary; and home economics, Florence Harrison of Washington, chairman, and Marie Dye of Michigan, secretary. In the section of agriculture, the subsection of experiment station work elected F. J. Sievers of Massachusetts chairman and W. W. Burr of Nebraska secretary, the subsection of extension work J. C. Kendall of New Hampshire chairman and C. A. Keffer of Tennessee secretary, and the subsection of resident teaching F. H. H. Calhoun of South Carolina chairman and C. Larsen of South Dakota secretary.

In the standing committees changes were made as follows: W. H. Evans was appointed to that on experiment station organization and policy for 3 years vice E. W. Allen, deceased, R. K. Bliss of Iowa and D. P. Trent of Oklahoma succeeded L. N. Duncan of Alabama and H. C. Ramsower of Ohio for 3 years on the committee on extension organization and policy. J. M. Thomas of New Jersey was succeeded by E. M. Freeman of Minnesota for 3 years on the commitee on military organization and policy; and H. B. Shaw of North Carolina by R. L. Sackett of Pennsylvania for a like term on the committee on engineering experiment stations. C. W. Pugsley of South Dakota was appointed for 2 years to the committee to give attention to the radio problem vice F. J. Kelly of Idaho. R. H. Smith of the Massachusetts Institute of Technology succeeded E. P. Warner of the same institution for 3 years on the committee on aeronautics. No change was made in the joint committee on projects and correlation of research, but S. B. Doten of Nevada succeeded G. A. Dean of Kansas and J. W. Roberts of the U. S. D. A. Bureau of Plant Industry succeeded C. L. Shear on that on publication of research. S. W. Fletcher of Pennsylvania was made chairman of the station section of this committee.

American Society of Agronomy.—The twenty-third annual meeting of this society was held at Washington, D. C., November 20 and 21, 1930.

The opening meeting was devoted to a report on the Second International Congress on Soil Science (E. S. R., 63, p. 799). The activities of Commission I, Soil Physics, were described by G. W. Conrey; Commission II, Soil Chemistry, by R. Bradfield; Commission III, Soil Biology and Bio-chemistry, by S. A. Waksman; Commission IV, Soil Fertility, by A. B. Beaumont; and Commission V, Soil Classification, by R. S. Smith.

The first symposium in the crop section dealt with plant breeding and included papers on Breeding for Yields in Crop Plants, by C. M. Woodworth; Cytology Studies in Relation to Crop Breeding Problems, by F. Griffee; Breeding Rust-Resistant Varieties of Spring Wheat, by C. H. Goulden and K. W. Neatby; Induced Mutation in Cereal Breeding, by L. J. Stadler; Cooperative Potato Breeding—Results to Date, by C. F. Clark; and Cooperative Potato Breeding—Plans for Future Development, by F. J. Stevenson.

The second session in the crops section was devoted to a general crops program. Among the papers in this group were Agronomic Problems for the Arid Region, by E. D. Ball; Erosion from Uncultivated Lands in the Intermountain Region, by C. L. Forsling; Native Vegetation Studies in the Pre-historic Lake Bonneville Basin (Utah and Nevada), by G. A. Burr; A Quarter Century of Dry-Farming at Nephi, Utah, by A. F. Bracken and G. Stewart; Studies in Plat Technic, by R. J. Garber; and Further Studies on the Sap of Corn Plants as an Indicator of Nutrient Needs, by N. A. Pettinger.

In the soils section the first symposium on cultural changes in soils, held jointly with the American Association of Soil Survey Workers, included papers on Changes in the Content and Form of Soil Nitrogen Due to Cultural Operations, by T. L. Lyon; The Modification of Soil Organic Matter by Cultural Treatments, by W. L. Powers; The Influence of Cultural Practices on the Reaction and Calcium Content of Soils, by O. M. Shedd; The Relation of Cultural

Practices to Soil Erosion, by H. H. Bennett, G. W. Musgrave, and H. Dunlavy; The Effect of Silvicultural Practices, Forest Removal, and Reforestation Upon Soil Character, by M. F. Morgan; The Influence of Cultural Practices on a Specific Soil Type, by H. Jenny; with an informal discussion by C. F. Marbut.

The Nature of Soil Organic Matter and Its Relation to Soil Fertility was the subject of the second soils symposium, which embraced papers on Green Manures as Sources of Organic Matter in Soil, by N. R. Smith; Soil Organic Matter Studies in Florida Sandy Soils, by R. M. Barnette and J. B. Hester; The Meaning of Carbon Nitrogen Ratio in Terms of Soil Fertility, by F. J. Sievers; Soil Organic Matter and the Fertility of Variously Treated Plots, by J. W. White; Effect of Temperature and Moisture on Soil Organic Matter, by H. Jenny; Soil Organic Matter and Its Decomposition Viewed from a Thermochemical Point of View, by F. H. Hesselink van Suchtelen; Base Exchange Capacity of Soil Organic Matter, by W. T. McGeorge; and Soil Organic Matter as a Physico-Chemical Complex, by S. Mattson.

A symposium on diagnosing soil deficiencies and crop needs opened the program of the fertilizer section. Papers were presented on How Reliable Are Existing Chemical Methods for Determining Soil Deficiencies of Ash Constituents of Plants, by G. S. Fraps; The Value of Pot Experiments as Used in Europe and America in the Determination of Soil Deficiencies, by M. F. Morgan; Experiences with the Neubauer Method for Determining Soil Deficiencies, by S. F. Thornton; What Have Field Experiments Contributed Toward the Problem of Determining Soil Deficiencies? Shall We Continue Them? by H. J. Harper; and The Diagnostic Value of Plant Symptoms in Determining Nutrient Deficiencies of Soils, by J. P. Jones. A second fertilizer symposium on production characteristics and use of the several carriers of fertilizer nitrogen included papers on Ammonium Sulfates, Chlorides, and Nitrates, by J. W. White; Sodium and Calcium Nitrates, by A. W. Blair; Cyanamid and Urea, by M. C. Sewell; and Mono- and Di-ammonium Phosphates, by R. M. Salter.

There were three symposia of interest to extension specialists. The first, dealing with pasture improvement, embraced papers on Pasture Fertilization, by J. S. Owens; Ohio's Pasture Improvement Program, by E. E. Barnes; Maryland's Pasture Improvement Program, by F. W. Oldenburg; and The Pasture Problem in Iowa and How It May Be Solved, by W. H. Stevenson and P. E. Brown. The second group was devoted to the production of quality tobacco and included papers on the North Carolina Program, by E. Y. Floyd; the Tennessee Program, by R. H. Milton; and the Massachusetts Program, by R. W. Donaldson. The third group of extension papers, concerned with control of soil erosion, included A Review of the National Program by H. H. Bennett, and of What New Mexico, Nebraska, and Louisiana are Doing, by G. R. Quesenberry, P. H. Stewart, and C. J. Hutchinson.

The president's address was given by W. P. Kelley on the agronomic significance of base exchange. The usual reports were received from the editor, the secretary-treasurer, and the several committees of the society. The Chilean Nitrate of Soda Nitrogen Research Award was presented to J. J. Skinner of Washington, D. C., L. G. Willis of North Carolina, and J. K. Wilson of New York. Officers for the ensuing year are as follows: President, W. W. Burr; vice presidents, A. B. Beaumont, S. A. Waksman, G. Stewart, and R. I. Throckmorton; editor, J. D. Luckett; secretary-treasurer, P. E. Brown; and representatives on th tion for the Advancement of Science, W. J

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EDITORIAL

RESEARCH AT THE 1930 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The recent convention of the Association of Land-Grant Colleges and Universities was less conspicuously concerned with matters directly pertaining to research than some of its predecessors, but nevertheless it afforded opportunity for presenting considerable that was interesting and important. To be sure, little was heard along the lines so common a few years ago on such abstract questions as the intrinsic importance of research and the need of fostering it. In the general sessions, in fact, aside from an extensive and appreciative survey in the presidential address of what the experiment stations have contributed to the economic and social well-being of the Nation, emphasis seemed to have shifted largely to topics on which opinion has less definitely crystallized. So far as the association's membership is concerned, the fundamental status of research in agriculture and home economics has evidently become so well understood and so tacitly recognized that its academic discussion is no longer deemed an essential element of every convention. The current problems of this research are rather specifically those of organization, orderly development, and relationships, and in the sections of agriculture, home economics, and engineering opportunity for the consideration of these and kindred details was well provided for.

The termination on June 30, 1930, of the first five years of experiment station activity under the Purnell Act was noted in the subsection of experiment station work by a brief review of the developments during this period. This review, presented by Dr. W. H. Evans, acting chief of the Office of Experiment Stations, brought out, first of all, that the forebodings sometimes expressed in the past as to the probable effect of this increased Federal outlay upon State support of the stations have been largely unjustified. At 14 stations it appears that the increased State support has actually been greater than the Purnell allotment, while "in not a single instance has the State's contribution to the station's support been reduced proportional

to the increase received under the Purnell Act" for the stations as a whole.

Institutional support of the research program through conservation of the fund against depletion by capital expenditures on buildings and land has also been significant. Although the Purnell Act permitted the use of not to exceed 10 per cent of its funds for such purposes, the highest average expenditure for any year since its enactment has never reached 2 per cent. In 1929 the States contributed $877,862 toward buildings and lands for station purposes as contrasted with only $38,557 from the Federal funds.

A marked influence of the act in stimulating research in the newer fields of inquiry was indicated. During the five-year period $3,113,000, or nearly one-third of the total Purnell appropriations of $9,600,000, was allotted to agricultural economics alone, while home economics received $1,194,000 and rural sociology $401,000. A similar emphasis is indicated in a classification of the Purnell projects active in 1929–30 as shown by the classified list of these projects just published by this Office. According to this list, 310 of these 1,221 projects were in agricultural economics, 125 in home economics, 38 in rural sociology, and 50 in agricultural engineering, as compared with a total of 698 projects in all other subjects. As was brought out even more definitely in the ensuing discussion, this showing is especially encouraging in view of the difficulties experienced in organizing these relatively unexplored fields and the scarcity of available workers. In agricultural economics and rural sociology the number of these workers increased from approximately 100 in 1925 to 265 in 1930. Marked improvement in the methods and program of research was also noted, as well as a pronounced development of cooperation between the stations, the U. S. Department of Agriculture, and other agencies. In marketing alone there are now 162 projects, and in these all but 2 of the States are represented. In rural sociology, the number of stations participating has grown from 11 to 21, and in home economics from 4 to 44. The act has also apparently been an influential factor in formulating and stabilizing research in agricultural engineering.

In the older fields of station work, concrete examples of progress definitely accreditable to the influence of the act are somewhat more difficult to differentiate, as many projects now transferred to it had previously been provided for in other ways, but a wide range of profitable activity is clearly indicated. By way of summary, Dr. Evans concluded that "the Purnell Act has made it possible to greatly enlarge the fields of experiment station activity, increase their personnel, pay better salaries, provide better trained research workers along some lines, and to secure more prompt publication of the results of research. . . . The results attained in the first five years

of the Purnell Act have been of great scientific and practical importance, fully justifying the faith of those who were instrumental in securing its passage that it would aid in solving some of the problems of rural life."

The present status of agricultural engineering research in the land-grant institutions was discussed by Mr. R. W. Trullinger of the Office of Experiment Stations before the engineering section of the association. According to his data, "this program of research now numbers considerably more than 300 major projects of research and investigation, and employs in the neighborhood of the equivalent of 75 full-time research agricultural engineers, who are trained basically in engineering and physics and are generally versed in the industrial requirements of agriculture and in agricultural technology. It represented an investment during the fiscal year 1929–30 of approximately $350,000. The subject of power development and transmission and mechanical equipment leads with 132 projects at 33 different State research institutions. Structures is second with 41 projects at 21 institutions. There are 33 projects in irrigation at 13 institutions, 24 projects in drainage at 12 institutions, 32 projects in rural electrification at 18 institutions, 21 projects in materials of construction at 12 institutions, 13 projects in rural sanitary engineering at 9 institutions, 11 projects in land clearing at 6 institutions, and 10 projects in soil erosion at 9 institutions."

Most of this research is conducted at the agricultural experiment stations, although the equipment available has not always been adapted to engineering research. "However, agricultural engineering now is becoming rather well understood as a research subject by agricultural experiment stations. They are adopting an attitude of sympathetic encouragement which is resulting, in some instances, in the provision of more adequate research facilities and personnel. They are also giving cooperation by supplying specific basic agricultural requirements which not only is making possible the extensive economic application of available engineering principles to agriculture, but in spite of limited facilities virtually is forcing efforts toward the material modification of many of them. In some cases also it already has resulted in the development of entirely new principles of a distinctly agricultural engineering character."

Mr. Trullinger suggested that on account of the handicap of limited facilities for engineering research in most agricultural research institutions, this movement "probably could still better attain its full objective with the cooperation of the engineering experiment stations, and in perhaps the majority of cases with their active participation. This should take the form of the development and manipulation of engineering principles in the design of equipment and of the final practical testing of new equipment on a cooperative

basis. An analysis of the existing research program in agricultural engineering suggests profitable lines of participation by engineering experiment stations which are particularly evident in the power and machinery field." Following a detailed review of the status of many of the existing projects, he concluded that "it seems safe to say that a well-rounded program of research on the distinctly engineering features of the application of physical and engineering principles to the practices of the industry of agriculture is available and ready to be put into effect in large part on short notice, and that the nucleus of an agricultural engineering research personnel is available to get it under way."

The organization of a program of research was considered by Miss Sybil L. Smith, also of the Office of Experiment Stations, in a paper before the section of home economics. This paper dealt especially with the existing status in home economics and made a plea for the establishment of a long-time and well-balanced research program in this field. Such a program was deemed desirable irrespective of the various systems of administration of home economics work to-day. "Fortunately," she declared, "a program does not have to be carried out in its entirety all at once, and the same goal may be set for the small department giving no graduate work, the large division or college offering graduate work, and the independent division of rural home research of the experiment station, although it may be years before the small department can hope to have a diversified program."

Miss Smith also spoke in some detail of the White House Conference, which followed the convention, and showed that the needs for certain types of research mentioned in the reports of various committees were being met in part by station projects already under way. Others were of such a nature as readily to lend themselves to active prosecution as opportunities become available.

The program of the joint sessions of the three subsections on agriculture centered around the topic of economic readjustments, and several of the papers dealt more or less directly with the research aspects of an economic program. Among these was one by Dr. H. R. Tolley of the Giannini Foundation of Agricultural Economics, who held that thus far, despite very considerable progress, "it seems that the research and extension workers have lacked either the vision or ability or funds to provide the farmers of the country with the necessary readjustments." He believed that, as regards the specter of overproduction, "through research we should strive to determine the areas where the different commodities can be produced most advantageously and through extension hasten sound readjustments and lower their costs to society."

"The problem of readjustment," he went on to say, "calls for a program of research in the economics of agricultural production of a much higher order than has yet been attempted. It calls for cooperation of the economists with engineers, plant and animal breeders, soil technologists, and others. The results of the studies must be reviewed from time to time to determine if changing economic conditions, improvements in technic, or other factors necessitate revisions. The research program must be accompanied by a carefully planned and executed extension program designed to acquaint the farmers in every area with the results of research and to aid individuals in deciding what adjustments to make and how to make them." "In my opinion," he added, "it is the greatest challenge that has ever come to the agricultural research and extension agencies."

In a discussion under the title of Research to Aid Adjustment in Agriculture, Prof. Eric Englund of the U. S. D. A. Bureau of Agricultural Economics pointed out that "adjustment in agriculture is a continuous process, resulting from numerous forces including technological improvements, regional and international competition, scientific discoveries, and changes in freight rates, tariffs, and consumer demand. It is a problem for research to explain these adjustments and to assist in steering their course according to some fairly definite policy so that they will not be left to blind forces of competition. This is in harmony with economic liberalism, which presupposes some degree of social direction of economic forces." He divided the research needed into that on general problems applicable to all agricultural regions and that on particular problems of mainly regional concern. Although it is the second general class which includes most of the work thus far in progress, he maintained that research on specific problems of regional adjustment will not yield the best results unless conducted against a background of investigations that concern all regions, such as price, trend, and demand and supply studies, agricultural finance, tariffs, public expenditures, and taxation. The continued development of technological research in plant and animal life he deemed fully as essential as in the past. "Stabilization of production—'orderly production' as a basis for 'orderly marketing' of which we have heard so much—rests in no small degree on dependable performance of plant and animal life. Regional adjustment, while emphasizing the economic idea of comparative advantages, is largely dependent on technological research."

That research into production lines must play a leading part in economic readjustments was also emphasized by Vice Director Andrew Boss of Minnesota, but he went on to say that without curtailing such studies there must be built up a body of economic knowledge. He advocated an aggressive program of economic in-

vestigation and education as the duty of every land-grant institution, and suggested that in such research greater use might be made of the experimental method, even to the extent of actually taking over representative farms and operating them as laboratory material. Another means of approaching the problem was brought out in a paper by Director H. W. Mumford, who described the agricultural adjustment project begun in 1928 in Illinois, where typical farming type areas have been grouped into units of convenient size, with adjustment conferences of farmers, experiment station and extension workers, and others for each of these areas.

Further contributions to the subject matter of economic research were made by Dr. M. S. Kendrick of Cornell University and Dr. G. W. Forster of North Carolina in a discussion of farm taxation and the methods of studying it, and by Dr. Charles D. Bohannan of the U. S. Bureau of the Census, who described in much detail the first census of distribution, which is now being assembled. It is thought that certain portions of this census material, especially the data pertaining to retail stores of different types, will prove to be of much potential usefulness to workers in a wide range of problems in agricultural economics and rural sociology.

The aid which the Federal Department of Agriculture is rendering to the experiment stations through the foreign plant introduction service was described by Mr. K. A. Ryerson, who is now in charge of that service. No fewer than 46 of the stations, he stated, had reported projects in which this imported material seemed likely to prove of value. Much of this demand is for types of wild vegetables for breeding operations, but it is also found useful in studies of forage crops, resistant cereals, and similar purposes.

Of somewhat similar purport was a paper by Dr. W. C. Curtis of Missouri, entitled The Division of Biology and Agriculture of the National Research Council and Its Current Activities. This paper described the organization of the council and some of the ways in which it is assisting in a wide range of research projects, chiefly by securing special funds for their prosecution from foundations and other agencies. Dr. Curtis also outlined the status of *Biological Abstracts*, in the continuance of which the council is actively interested.

What may be termed the administrative phases of the program of the association's subsection of experiment station work again centered quite largely around the topic of cooperation, and more especially cooperation between the stations and the Federal Department of Agriculture. The reports of both the committee on experiment station organization and policy and the joint committee on

projects and correlation of research took up this question, the former as to the responsibility of station directors for cooperative projects and the latter as to the possibilty of a more intensive study of the subject.

The report of the joint committee, presented by its chairman, Director F. B. Mumford of Missouri, indicated that nearly 1,200 of the 7,000 active station projects are now being conducted cooperatively by stations or groups of stations and the Department. Of these, 398 involved cooperation mainly with the Bureau of Plant Industry, 311 with the Bureau of Agricultural Economics, 134 with the Bureau of Animal Industry, 88 with the Bureau of Chemistry and Soils, 86 with the Bureau of Entomology, 68 with the Bureau of Public Roads, 50 with the Bureau of Dairy Industry, 25 with the Forest Service, 10 with the Bureau of Home Economics, and 6 with the Weather Bureau. About 14 per cent of these projects were supported by the States concerned with Purnell funds and 2 per cent with Adams funds. Every experiment station was represented, with California, Washington, and North Carolina leading with 53, 49, and 48 projects, respectively. There are also about 21 major regional projects in operation, involving the cooperation of groups of stations varying from 3 to 30 and including from 1 to 3 Department bureaus.

The committee believed that the further utilization of cooperation would result in still greater advantages to agricultural advancement and recommended the appointment of a special committee to make an intensive study of State-Federal cooperative relationships. Subsequently this committee was constituted to consist of Directors S. W. Fletcher of Pennsylvania, E. C. Johnson of Washington, and M. J. Funchess of Alabama.

A further question was raised by the joint committee as to the desirability of substituting for the six national cooperative projects organized following the passage of the Purnell Act a number of major coordinate fields of regional or national cooperative effort, so defined as to serve more effectively the present and prospective national needs. This question was referred back to the joint committee itself with the suggestion that it work out a comprehensive plan of projecting national cooperative programs of research and report its findings at the next convention.

The committee on experiment station organization and policy, in taking up the subject of cooperative relationships from the viewpoint of the director's responsibility, registered a belief that the responsibility for carefully scrutinizing and approving cooperative projects should be the same as in projects limited to the station itself. "Cooperation," it was stated, "will generally begin with the individual workers and they may well determine the details, but the final con-

sideration and signature of the memorandum of agreement should be accomplished through correspondence between the station director and the chief or head of the cooperating bureau or office." It was also suggested that the station directors should be kept informed by the officials of the Department as to the status of projects which it has undertaken, as under special legislation, within a State's boundaries.

The growing importance of forestry research and the close relationship of some of this research to that in the more commonly recognized fields of agriculture was suggested by the committee as raising a question of policy as to the use of Federal funds for station work in forestry. The committee was instructed to undertake a stndy of this question and report at the next meeting.

The report of the joint committee on publication of research as usual dealt with the current status of the *Journal of Agricultural Research*, for which it is directly responsible, but was supplemented by a paper by Dr. M. C. Merrill on the policy and functions of the *Journal* in relation to the experiment stations. Dr. Merrill is chief of publications of the U. S. Department of Agriculture, and the *Journal* has been published for several years under his immediate editorial supervision. He showed that from the opening of its columns to the experiment stations in 1914 to November 1, 1930, 755 papers from these institutions had been published, as compared with a total of 1,289 from the Department. With one exception all of the States have been represented, Minnesota leading with 68 papers, and followed by Kansas with 61, California with 55, and Wisconsin with 51. In the case of 11 States, however, less than 4 papers each have appeared in the 17 years. Throughout this period high standards have prevailed as to selection of material, but Dr. Merrill made it clear that "reports of current agricultural research that has reached a degree of finality justifying publication and that has significance in the fundamental problems pertaining to agricultural plants and animals in their biological and physical environment find an open door and a cordial reception from the committee awaiting them." Marked progress in recent months in accelerating the promptness of publication was also reported.

Taken as a whole, the 1930 convention was devoid of major developments as to research, but it laid the foundations for considerable progress in the future. The outstanding accomplishment was doubtless the authorization of additional committee studies of cooperative Federal and State relationships. This is a field in which the will and the way to cooperate must both be developed if success is to be expected. The convention gave aid in both directions, and added appreciably to the many indications that tangible progress is surely, even if somewhat slowly, being achieved.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The deaminization of cystine, J. C. ANDREWS (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 681–690*).—Supplementing his earlier work (E. S. R., 61, p. 107) on the deaminization of cystine in alkaline solutions in the presence of various heavy metal compounds, notably those of lead, the author of this contribution from the University of Pennsylvania Medical School has extended earlier conclusions, stating that "further studies on the deaminization of cystine in alkaline solution indicate that lead salts, when added to the alkaline solution, are more effective in increasing the extent of deaminization than any others examined. The extent of deaminization of cystine in solutions of various bases was studied, together with the effect of the addition of a variety of different salts.

"Of the bases used in this reaction, suspensions of calcium hydroxide produce the greatest amount of deaminization. The attainment of a maximum percentage of deaminization for any constant amount of cystine used requires the presence of considerably more calcium hydroxide than that corresponding to a saturated solution. Increase in calcium hydroxide over this optimum amount produces no higher degree of deaminization.

"Addition of lead salts to the cystine solution containing the optimum amount of calcium hydroxide causes no increase in percentage deaminization; below this optimum proportion lead salts cause a marked increase.

"Experiments on pure cysteine under conditions similar to those used for cystine indicate a percentage deaminization of between 3 and 5 per cent."

Kinetics of the reduction of cystine and related dithio (R-S-S-R) acids by reversible oxidation-reduction systems, P. W. PREISLER (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 767–784, fig. 1*).—In an investigation of which the report is here given as a contribution from Harvard University the author found that "dithio (R-S-S-R) acids were reduced by reversible oxidation-reduction systems of high reducing intensity, and reaction rates were obtained which resembled approximately those of second order reactions. These results serve as a criterion for the exclusion of certain reduction reactions as the predominating mechanisms.

"The reduction rates differed for the various acids studied and seemed to depend on the position and nature of the groups attached to the -S-S- linkage, the rates being higher in those cases in which the -COOH or a $-NH_2$ group was adjacent to the -S-S- linkage. The reduction rates decreased as the acidity was increased. Temperature coefficients calculated for certain of the reactions were rather unusual, and certain unexpected results were obtained for the effect on the reaction rates of the potential of the reversible reagent employed for the reduction; the rate of reduction was not affected by an alteration of the potential of the reagent employed when the oxidant-reductant ratio was changed, but the use of another system of different E_0 value did alter the rate of the reduction."

The apparent dissociation constant of glycine ethyl ester, O. H. EMERSON and P. L. KIRK (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 597–600, fig. 1*).—Noting that "according to the classical theory of the dissociation of weak electrolytes

the amino acids show much lower basic and acidic dissociation constants than would be expected from a comparison with other weak acids and bases," and that experimental attempts to test the "hybrid ion" and "inner salt" explanations of this behavior "have largely centered on formol titration methods in which the basic properties of the amino group are reduced," the authors of this contribution from the University of California Medical School suggest that "equally valid as evidence would be a corresponding titration of the amino group after destruction of the acidic properties of the carboxyl groups," and report the carrying out of the last-named principle, in the case of glycine, by esterifying the amino acid and determining the apparent basic dissociation constant of the ester. The K' value of a highly purified preparation of glycine ethyl ester was found to be 5.37×10^{-7}, and the conclusion reached was that "the significance of this value is better interpreted in terms of the 'Zwitterion' hypothesis of Adams and Bjerrum than in terms of the classical theory of dissociation."

Diethylbarbiturate buffer, L. MICHAELIS (*Jour. Biol. Chem., 87 (1930), No. 1, pp. 33–35*).—The author of this contribution from The Rockefeller Institute for Medical Research notes the lack of any buffer system covering the range centering at about pH 8 other than the borate buffers, and discusses briefly the disadvantages for such use of any of the salts of boric acid, noting especially the tendency of boric acid to unite with di- and polyhydroxylated organic compounds with the formation of complex acids of appreciable strength. "This gap in the buffer series is due to the fact that practically no acid was known with a dissociation constant around 10^{-8}," but diethylbarbituric acid, or "veronal," has been shown to have a dissociation constant of approximately the value named, and the author found a 0.1 M solution of the sodium salt of this acid to form buffer solutions useful in the indicated range.

It is stated that "10.30 gm. of sodium diethylbarbiturate (veronal sodium) are dissolved in CO_2-free water to a volume of 500 cc. The quality of the commercial preparation was satisfactory without recrystallization. It may be dried at 100° but loses only traces of moisture by this process. Ten cc. of this solution when titrated against 0.1 M HCl should use up accurately 10 cc. of the acid to the turning point of methyl red. If the veronal solution turns out to be a little weaker (say 1 per cent) a correction for the number of cubic centimeters indicated . . . may be applied. The error, on neglecting this correction, however, is practically negligible except for the range of pH < 7.2. . . . This buffer has a satisfactory buffer capacity between pH 7.0 to pH 9.4, and so covers not only the gap between the phosphate and the glycocoll buffers but it also duplicates the pH range of particular physiological importance around 7.4, for which only the phosphate buffer was available till now, except for the occasional and restricted use of the cacodylate buffer."

A synthesis of tryptophol, R. W. JACKSON (*Jour. Biol. Chem., 88 (1930), No. 3, pp. 659–662*).—In a contribution from Yale University the author notes the previous isolation of tryptophol, or 3-indole ethyl alcohol, as a product of the action of yeast growth upon tryptophane but finds no record of a synthesis of the first-named compound. He then proceeds to an account of the preparation of indole acetic acid from indole magnesium iodide by treatment with chloroacetonitrile and subsequent hydrolysis of the resulting 3-indole acetonitrile, the esterification of the acid by treatment either with absolute ethyl or with absolute methyl alcohol in the presence of a little dry hydrochloric acid gas as catalyst, and, finally, of the reduction of the ester to 3-indole ethyl alcohol, or tryptophol, by means of sodium and anhydrous methyl alcohol. The product thus synthesized showed close agreement in physical properties and nitrogen content with the product isolated from the substances formed by yeast from tryptophane.

Some redox indicators, L. MICHAELIS and H. EAGLE (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 713–727, figs. 6*).—The three dyes particularly described as regards their indicator value in oxidation-reduction systems in the present contribution from The Johns Hopkins Hospital and the Laboratories of The Rockefeller Institute for Medical Research, namely, gallocyanine, gallophenine, and brilliant alizarin blue, "have been known for a long time but were never used for any scientific purpose. They form entirely reversible redox systems and give true homogeneous noncolloidal solutions in the ordinary buffers in a concentration sufficient for any colorimetric use. These dyes turned out to be practically pure as delivered from the factory in so far as they contained no other reducible substance, at least none which would cause an overlapping of the titration curve or show a confusing color effect. As the course of the titration curves is strictly that of simple reversible systems, we may also exclude the possibility that any of these dyes might be a mixture of different chemical individuals with overlapping curves."

The three dyes are characterized in detail with respect to their indicator behavior in oxidation-reduction systems, and a table of the potentials of the half-reduced dyes at intervals of 0.25 pH unit from pH 5 to pH 10 is given, the reference point being the potential of the normal hydrogen electrode at 25° C. Technical details of general measurements in reversible oxidation-reduction systems are also discussed, an apparatus for use in the determination of oxidation-reduction titration curves is described, and the three new dyes are compared with indigo disulfonic acid and with methylene blue.

A vacuum tube potentiometer applicable for use with glass electrodes of high resistance, D. DUBOIS (*Jour. Biol. Chem., 88 (1930), No. 3, pp. 729–741, figs. 8*).—In this article "a potentiometer is described in which a single screen grid vacuum tube is used. Plate current is so reduced, by lowering the screen grid voltage, that it can be carried directly through a sensitive galvanometer. The tube is first balanced by proper adjustments of the grid voltages until a working condition of zero control grid current is obtained, and then the cell of unknown voltage and a standard potentiometer are included in the control grid circuit. When the balance of the tube is reestablished the voltage of the unknown may be read directly by the standard potentiometer.

"This potentiometer is sufficiently sensitive when used with resistances as high as 100,000 megohms for accurate pH determination. The potentiometer when adjusted to a reasonable accuracy takes less than 5×10^{-15} amperes from the glass electrode, and this low current causes no drift of glass electrode voltage. Stable conditions of the tube occur in less than 5 minutes from switching on the batteries."

Diffusion of yeast invertase through collodion membranes, J. M. NELSON and A. H. PALMER (*Jour. Biol. Chem., 87 (1930), No. 1, pp. 1–6*).—In a brief note contributed from the department of chemistry of Columbia University is recorded the observation that in the dialysis of crude yeast invertase solutions in collodion bags more of the invertase passed through the membrane at pH 6.7 than at pH 4.6, whereas the loss of enzyme during dialysis was greater at pH 4.6 than at pH 6.7.

Studies on crystalline urease.—Inactivation by ultra-violet radiation, sunlight with the aid of a photodynamic agent, and inactivation by trypsin, H. TAUBER (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 625–628, fig. 1*).—Exposure of urease alone to direct sunlight caused no inactivation under the conditions of temperature and length of exposure employed. In the presence of eosin, however, inactivation did take place. Ultra-violet light inhibited urease activity to an extent proportional to the distance from the source of radiation, and the presence of eosin increased this effect. "Crystalline urease is inactivated

by trypsin in the presence of a protective colloid, which would indicate its protein nature."

The determination of peptic activity: An examination and application of the Gates method of proteolytic enzyme titration, A. GILMAN and G. R. COWGILL (*Jour. Biol. Chem., 88 (1930), No. 3, pp. 743–752, figs. 3*).—The Gates method, or estimation of peptic activity by the measurement of the increase in light transmission of the gelatin-silver layer of fully developed photographic film, fixed without hardening, on exposure of this gelatin to the action of the enzyme solution, is regarded by the authors of this contribution from the physiological chemistry laboratory, Yale University, as being in principle the best available method. The present authors find amplification and modification desirable, however, with respect to manipulative detail, and here describe specifically the preparation of the film, the digestion, the regulation of the temperature and the pH value, the measurement of the penetrability of the digested film by light, the sensitivity of the method, the determination and calculation of the peptic activity of solutions of unknown value, and the preparation of standard solutions.

By reason of the very high temperature coefficient of the digestion reaction it was found desirable to control digestion temperature to 0.02° C. in a water bath. The reaction pH 2 was found the most favorable and was suitably obtained by the use of a glycine-sodium chloride-hydrochloric acid buffer mixture. Dilution of the gastric juice samples in this buffer solution and the maintenance of a temperature of 25° in place of that optimal for peptic activity were both necessary for the prevention of a complete digestion of the films in the 10-minute digestion period.

The adsorption of vitamin A on silica gel, L. L. LACHAT, R. A. DUTCHER, and H. E. HONEYWELL (*Pennsylvania Sta. Bul. 258 (1930), p. 8*).—It is stated briefly that "vitamin A in cod-liver oil may be adsorbed on highly activated silica gel so tenaciously that it can not be rendered available when the silica gel is fed to rats. Toluene removes the adsorbed vitamin A from the silica gel, while acetone extracts are inactive."

The alleged contamination of carotene by vitamin A, N. S. CAPPER (*Biochem. Jour., 24 (1930), No. 2, pp. 453–455, fig. 1*).—In this study the criticism that even the purest samples of carotin may still contain traces of vitamin A as present in cod-liver oil has been tested by a comparison of the ultra-violet absorption spectra of carotin and of a cod-liver oil concentrate, since Dulière, Morton, and Drummond (E. S. R., 63, p. 8), failing to detect in samples of carotin the absorption band at 328$\mu\mu$ considered to be characteristic of vitamin A, had suggested that the absorption of carotin in this region may have been sufficiently dense to obscure completely any maximum due to the vitamin.

The carotin used was prepared from carrots and purified to a melting point of 178° C. by 12 recrystallizations from cyclohexane. "In biological experiments the minimal daily dose necessary to promote growth in rats had been found to be about 0.002 mg." The cod-liver oil concentrate was said to "promote growth regularly at 0.01 mg., with one isolated response at 0.0033 mg." The materials were dissolved in dry ether and examined in 1-cm. cells in a Hilger sector photometer used in conjunction with a Hilger E_3 quartz spectrograph.

The absorption of carotin at 328$\mu\mu$ was considerably less than that of the cod-liver oil concentrate dissolved at the same concentration, and not sufficiently intense, in the opinion of the author, to obscure the absorption at this point caused by the presence of the cod-liver oil factor in an amount sufficient to account for the physiological activity of the pigment. It was concluded that "unless the close relation between the vitamin A activity of cod-liver oil and

the 328$\mu\mu$ band is deceptive, it is essential to assume that vitamin A can exist in at least two forms, or that carotin behaves as provitamin A."

New color reaction of ergosterol.—Differentiation of ergosterol from irradiated ergosterol [trans. title], R. MEESEMAECKER (*Jour. Pharm. et Chim., 8. ser., 11 (1930), No. 8, pp. 380–384*).—The author states that the addition of acetic anhydride, followed by zinc chloride, to a solution of ergosterol in different solvents results in the formation of a rose color turning to a very stable green, which seems to be characteristic of the sterols of the ergosterol group.

The addition of zinc chloride alone to a chloroform solution of ergosterol forms a rose color if the solution is fresh or kept in the dark and a green color with solutions exposed to the light or ultra-violet radiation.

An ether solution treated in the same way develops a green color, while with a benzene or petroleum ether solution there is no color reaction.

Note on the antimony trichloride reaction of cod liver oils, J. C. DRUMMOND (*Jour. Soc. Chem. Indus., Trans., 49 (1930), No. 22, p. 258T, fig. 1*).—The author reports briefly that he has been unable to confirm the observation of Hawk (E. S. R., 62, p. 112) that samples of cod-liver oil exposed to the air give deeper blue colors with antimony trichloride than fresh samples. Curves are given of the colors in blue units of four samples of cod-liver oil examined fresh and at weekly intervals during exposure to air and diffused daylight in shallow dishes at room temperature. All of these curves showed a gradual decrease in color with increase in length of exposure.

The chemistry of vitamin D, F. L. MACLEOD (*Jour. Nutrition, 2 (1930), No. 5, pp. 517–530*).—A comprehensive review of the literature on the subject, with a bibliography of 32 titles.

A method for the estimation of the acid-base balance in the ash of plants, D. E. FREAR (*Jour. Biol. Chem., 88 (1930), No. 3, pp. 675–681*).—This is a contribution from the Rhode Island Experiment Station.

The author notes that "the common method of determining the excess of acidic or basic elements present in the ash of plant or animal tissue is to make a rather complete analysis of the material, computing the excess from the results of this analysis. Such a procedure is difficult, long, and the results secured are subject to the errors which may appear in the individual determinations." He then proceeds to an account of an investigation by which "it is shown that sulfur and chlorine are retained when plant material is ignited in the presence of magnesium nitrate. The acid-base balance of the plant, determined by titration of this ash, is in good agreement with the stoichiometric balance of the amounts of strong acidic and basic elements obtained by chemical analysis."

The procedure, which was found to require much less time than did a complete analysis for the elements concerned, is thus stated:

"Weigh 2 gm. of finely ground plant material into a porcelain beaker. Add to this about 10 cc. of distilled water, with care, so that no mechanical loss occurs. After the entire mass of the plant material has been wetted, add 25 cc. of a solution containing 25 gm. of magnesium nitrate per 100 cc. Mix, and place on an electric hot plate regulated so that the mix simmers but never boils violently. Allow the liquid to evaporate, heating in all about 3 to 4 hours. When the residue is entirely dry, but not so dry as to become explosive (this degree of drying is best regulated by experience), remove from the hot plate, cover, and place in an electric furnace heated to about 250°. After 15 minutes, or when it is evident that the first reaction is over, raise the temperature of the furnace to 500°. This heating may be prolonged if black particles of unburned carbon are in evidence, but ordinarily requires not more than 30 minutes. The temperature should never be greater than 500°. Remove from

the furnace when the contents of the beaker are white or nearly so, and allow to cool. Add about 10 cc. of water cautiously, allowing the ash to become thoroughly wet. Add 60 cc. of normal nitric acid from a burette, and digest on a hot plate just below the boiling temperature for 3 hours. Transfer the solution and any insoluble residue to an Erlenmeyer flask and titrate the excess acid with normal sodium hydroxide, using methyl red indicator."

It is further recommended that blank determinations be carried out with the use of 1 gm. of sugar as sample in place of the 2-gm. sample of the plant material.

Method and procedure of soil analysis used in the division of soil chemistry and physics, W. O. ROBINSON (*U. S. Dept. Agr. Circ. 139 (1930), pp. 19*).—The fusion method of soil analysis developed for use in the soil chemistry laboratory of the Bureau of Chemistry and Soils is described, directions are given for the preparation of the soil sample after it reaches the laboratory, and the limits of error allowable in a satisfactory analysis are discussed, the limits of error for various elements being given in percentages and in pounds per acre. Methods and procedures for the determinations of moisture, loss on ignition, organic matter, chlorine, fluorine, and the oxides of silicon, titanium, aluminum, iron, manganese, calcium, magnesium, potassium, sodium, phosphorus, and sulfur are given. "The method is designed to show accurately the ultimate composition of the soil for scientific purposes and has only a very general application to problems involved in soil-fertility studies."

Some methods for detecting differences in soil organic matter, E. C. SHOREY (*U. S. Dept. Agr., Tech. Bul. 211 (1930), pp. 27*).—The author applied to soils and soil extracts a considerable number of the tests for individual classes of organic compounds, studied other means of differentiation more specifically designed for the examination of soils, and reached the following among other results and conclusions:

"The dark color of the alkali extracts of soils (humus extract) is not due to the absorption of oxygen during the process of extraction, and such color can not be considered an indication of the presence of phenolic compounds. Measurement of the quantity of organic matter by comparing the depth of color of humus extracts is not possible; but the fact that the shades of color obtained differ can be offered as proof of differences in kind of organic matter. When a soil is suspended in dilute alkali and air or oxygen is passed through it, there is an absorption of oxygen and formation of an alkali carbonate. The oxygen absorbed can be measured as can the carbon dioxide liberated after acidifying the suspension. This absorption of oxygen and formation of carbonate is different in different soils. On making an alkaline extract of a soil and fractionating this, nitrogen is found in all fractions, as well as in the soil residue. The percentage of the total nitrogen found in the various fractions varies with the soil.

"The presence of two classes of organic nitrogenous compounds not usually considered in discussing soil nitrogen is indicated. These are chitin and its derivative glucosamine, and some member of the indol group. The occurrence of volatile organic compounds in soils is discussed, and a new method of investigation along this line is reported. The fate of organic nitrogen compounds in soils, when subjected to oxidation with hydrogen peroxide, is stated; and this treatment is proposed as a means of showing differences in the organic nitrogen content of soils. The formation of azophenine, when some soils are heated with aniline, is described, and this formation is suggested as a means of showing the presence or absence of some as yet unknown organic soil constituents.

"*The results of acid hydrolysis of soils* from a nitrogen standpoint are discussed, and this is pointed out as a method of showing differences in soil organic matter. The use of alcohol, water, and alternative alcohol and water extraction as a means of showing differences in the organic matter of soils is discussed."

A method for measuring carbon dioxide evolution from soil, H. Humfeld (*Soil Sci., 30 (1930), No. 1, pp. 1–11, pl. 1*).—Following a classificatory summary of previously published methods, the author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils notes a procedure consisting essentially in absorbing and titrating the carbon dioxide content of a measured flow of air drawn through a box of which the open side was set into the surface of the soil.

The collecting unit or box was of galvanized iron, 8 in. long and 3 in. in width and height, ¼ in. tubing at each end of the box serving as inlet and outlet. Absorption was carried out in a train of four bottles, each of about 1 liter capacity, of which the first and fourth were empty while the second and third contained each 800 cc. of potassium hydroxide solution from 0.08 to 0.16 N. Suction was found to be provided satisfactorily either by a motor-driven pump or by a water aspirator.

"In order to obtain air of uniform carbon dioxide content, a rubber tube, 3 to 4 ft. long, was fastened to the inlet of the box and tied up, with the opening about 3 ft. above the surface of the soil. The outlet tube was connected by means of rubber pressure tubing to the calibrated flow-meter, which in turn was fastened by the same means to the glass tube in the first bottle. . . . It was found that 10 liters of air an hour was sufficient to carry off the carbon dioxide from the soil, even at the highest rate of evolution encountered. Lower rates could be used with smaller amounts of carbon dioxide, but it was found that with smaller rates of flow the adjustment to keep the flow steady was more difficult."

The construction of the flow-meter is described. Photographs show the set in use on the greenhouse plats, for which it was especially designed, and in the field.

An improved method for the determination of available phosphoric acid of soils, S. Das (*Soil Sci., 30 (1930), No. 1, pp. 33–48*).—Testing the methods concerned upon a variety of Indian soils, including acid soils, humus and lateritic, alkali and calcareous soils, and noncalcareous soils, the author of this contribution from the Agricultural Research Institute of Pusa, India, concluded that "*the results obtained showed that the potassium carbonate* method is equally applicable to all types of soil, whereas the citric acid method breaks down as a discriminating agent for evaluating the available phosphoric acid of alkali and calcareous soils. Besides the obvious advantage of a more general application, the potassium carbonate method possesses several other points in its favor, and should therefore replace the existing Dyer's method or any of its substitutes dependent upon acid digestion for estimating the available phosphoric acid of soils."

The use of preservatives to prevent loss of nitrogen from cow excreta during the day of collection, R. B. French (*Jour. Agr. Research [U. S.], 41 (1930), No. 6, pp. 503–506*).—"Cow feces and urine, placed together, but unmixed, showed during an 18-hour period losses of from 1 to 2.6 per cent of the total nitrogen present. When these excreta were thoroughly mixed the losses varied from 6 to 30 per cent of the nitrogen.

"Copper sulfate, zinc sulfate, and formaldehyde, when added in small concentrations to mixtures of feces and urine, were highly effective in preventing losses of nitrogen as ammonia." Copper sulfate, though effective for the pur-

pose, was found objectionable on account of the plating reaction with the zinc surface of galvanized iron containers, and formaldehyde, equally effective in preventing the losses of nitrogen in question, was the reagent actually put in use.

The paper is a contribution from the Institute of Animal Nutrition, Pennsylvania State College.

Reducing equivalents for some rare sugars as determined by colorimetric methods, C. F. Poe and D. Klemme (*Jour. Biol. Chem., 87 (1930), No. 1, pp. 7–12*).—The glucose reducing equivalents of the commoner sugars were redetermined by the older colorimetric methods in the work noted in this communication from Columbia University, and were determined for certain sugars—*l*-arabinose, xylose, levulose, galactose, mannose, and lactose and maltose monohydrates—by several more recent methods. In the cases of a number of rarer sugars—*d*-arabinose, cellobiose, fucose, glucoheptose, β-*d*-glucose, glucosamine, and rhamnose—the same constant was determined "with all the satisfactory colorimetric methods."

METEOROLOGY

Atmospheric and solar changes [trans. title], H. H. Clayton (*Met. Ztschr. [Brunswick], 47 (1930), No. 10, pp. 393–401, figs. 8*).—This article summarizes data and conclusions with reference to periodic changes in solar radiation and their influence on the weather, previously noted (E. S. R., 63, p. 416).

The daily, monthly, and annual normals of precipitation in the United States, based on the 50-year period, 1878 to 1927, inclusive, P. C. Day (*U. S. Mo. Weather Rev. Sup. 34 (1930), pp. [1]+101*).—Revised normals are given which supersede those computed in 1907, previously noted (E. S. R., 20, p. 614), in the climatological work of the Weather Bureau. The sums of daily precipitation by 14-day periods are also given, "to facilitate theoretical studies of the annual march and distribution of precipitation. . . . It is believed these data are decidedly superior to the ordinary amounts of precipitation for the unequal calendar months which, moreover, are deemed to be too long a period of time in which to bring out certain important characteristics."

Meteorological observations (*Maine Sta. Bul. 353 (1929), pp. 149, 150*).—Observations at the University of Maine on temperature, total precipitation, snowfall, cloudiness, and wind during 1929 are briefly summarized by months. The mean temperature, total precipitation, and snowfall for the 61 years of continuous observation at Orono are also given. The mean temperature of the year was 44.26°F., as compared with a 61-year mean of 42.69°. The total precipitation was 37.56 in., as compared with the 61-year mean of 39.6 in. The snowfall was 91.3 in., as compared with the 61-year mean of 86.35 in. The number of cloudy days was 80.

Meteorological observations, [September–October, 1930], C. I. Gunness and K. M. Wheeler (*Massachusetts Sta. Met. Ser. Buls. 501–502 (1930), pp. 4 each*).—Observations at Amherst, Mass., are summarized and briefly commented upon.

Meteorology report, C. O. Cromer and C. A. Kern (*Pennsylvania Sta. Bul. 258 (1930), pp. 49, 50*).—Observations on temperature, precipitation, rainy days, and cloudiness at State College, Pa., are summarized for each month of 1929.

"The annual mean temperature was below the normal for the preceding 43 years. The hottest day during the year was 95° F. on September 3. The monthly mean temperatures for March, May, June, July, and September were higher than their normals for the 43 years preceding. The lowest temperature recorded during the year was for January 14 when the mercury dropped to −4°. The precipitation for the year amounted to 39.07 [in.], which is 0.7 in. less

than the average rainfall for the previous 45 years. February, May, June, July, and August were subnormal, while the remainder of the year was somewhat in excess, especially April and October, with rainfalls 2.4 and 4.16 in. in excess of the normals for these months. July recorded the smallest rainfall of any month of the year, —1.39 in., while in October there was a precipitation of 7.06 in., which was the heaviest for any month of the year. The snowfall for the year was 28.46 in., only about half that of the previous year, which was 59.12 in."

Phenological observations in 1929 [trans. title], H. Bos ET AL. (*Landbouwk. Tijdschr. [Amsterdam], 42 (1930), No. 511, pp. 657–689, figs. 6*).—Further observations relating to plants, birds, and insects, in continuation of those which have been carried on for many years under the auspices of the Netherlands Phenological Society, are reported.

SOILS—FERTILIZERS

Soil survey of Menominee County, Michigan, J. W. MOON ET AL. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1925, No. 31, pp. 43, fig. 1, map 1*).—According to this report, prepared in cooperation with the Michigan Experiment Station and the Michigan Department of Conservation, Menominee County has a land area of 675,840 acres, is located in the southern part of the Michigan Upper Peninsula, lies within the glaciated region, has surface features formed during the late Wisconsin glacial period, and is drained by the Menominee River, the Big Cedar River, and the Ford River.

Onaway loam, with 16.7 per cent of the total area included in the survey, Onaway fine sandy loam with 12.1 per cent, and rifle peat with 29.1 per cent, are the more extensive among the classified soils, totaling 28 types of 23 series.

[Soil Survey Reports, 1926 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1926, Nos. 15, pp. 35, pl. 1, fig. 1, map 1; 16, pp. 61, pls. 3, fig. 1, map 1; 17, pp. 30, fig. 1, map 1; 18, pp. 32, pls. 2, fig. 1, map 1; 19, pp. 30, fig. 1, map 1*).—The five survey reports here noted were prepared with the cooperation, respectively, of the Idaho, Oregon, Michigan, Missouri, and Ohio experiment stations.

No. 15. *Soil survey of the Bear Lake Valley area, Idaho*, E. N. Poulson and N. C. Derrick.—The tract surveyed includes 222,720 acres in the extreme southeast corner of Idaho and consists, topographically, of a long narrow valley fairly level in the valley floor. The area is drained by Bear Lake Outlet and other tributaries of the Bear River.

The report lists 10 series including 15 types, of which Ritzville silt loam occupies 10.4 and Bear Lake clay 17.9 per cent of the total soil area. The rough mountainous section was found to include 37 per cent and other soils listed unclassified consisted of 1.3 per cent of alluvial soils, peat 5.8, rough broken and stony land 2.2, and coastal beach and dune sand 0.7 per cent.

No. 16. *Soil survey of the Grande Ronde Valley area, Oregon*, A. E. Kocher et al.—The tract considered in this report forms a part of Union County, northeastern Oregon, comprises 184,960 acres, and has "typical windblown relief."

The soils found consisted of 11 series comprising 28 types. Gooch silt loam, amounting to 7.8 per cent of the total land covered, was found the most extensive classified soil and 17.1 per cent of rough stony land constituted the surface mapped unclassified.

No. 17. *Soil survey of Jackson County, Michigan*, J. O. Veatch et al.—Comprising an area of 452,480 acres south-centrally located in the Michigan Lower Peninsula, Jackson County has a surface in general gently undulating

to moderately hilly, and is for the most part adequately drained by the headwater tributaries of the Raisin, Huron, Kalamazoo, and Grand Rivers.

The soils mapped consisted of Hillsdale sandy loam, amounting to 39.8 per cent, Fox sandy loam with 14.9, and rifle peat, covering 11.6 per cent of the total area surveyed, together with less extensive classifications making a total of 17 series inclusive of 21 types, with 0.1 per cent of marsh, unclassified.

No. 18. *Soil survey of Polk County, Missouri*, H. H. Krusekopf et al.—Polk County consists of 410,240 acres of rolling to somewhat hilly land located in southwestern Missouri and containing 11 soil series, including 25 types, and 1.9 per cent of rough stony lands, unclassified. Baxter gravelly silt loam, constituting 22.6 per cent of the entire county, is represented as the most extensive aggregate area, followed by Baxter silt loam with 10 per cent.

No. 19. *Soil survey of Washington County, Ohio*, S. W. Phillips et al.—Occupying 403,200 acres in southeastern Ohio, Washington County possesses generally a rolling upland and the wide, smooth valleys of the Ohio and Muskingum Rivers as principal physiographic features. The entire county lies in the Ohio River drainage basin, and has for the most part an excellent surface drainage.

Meigs silty clay loam occupies 48.7 per cent of the total area of the county and is followed in areal extent by Upshur clay, of which 15.8 per cent was found, together with less extensive types, totaling 21 and here classified as 14 series, with 12.2 per cent of steep broken land.

[Soil Survey Reports, 1927 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 2, pp. 24, fig. 1, map 1; 3, pp. 43, fig. 1, map 1*).—The two survey reports here noted were prepared with the cooperation of the respective State experiment stations and related State organizations.

No. 2. *Soil survey of Lenoir County, North Carolina*, R. C. Jurney and W. A. Davis.—Lenoir County is a tract of 255,360 acres in eastern North Carolina, consisting of nearly flat to slightly rolling uplands with broad, flat "pocosins," which "are inadequately drained, not being crossed by any well-defined natural drainage way. Other flat poorly drained areas are on the river terraces. The first bottoms and swamps are inadequately drained and are subject to overflow." The Neuse River is the drainage outlet for most of the county.

The soils of this area are listed as 14 series of 22 types, headed by 21.2 per cent of Norfolk fine sandy loam, together with swamp, unclassified, amounting to 5.4 per cent of the county.

No. 3. *Soil survey of the Buckeye-Beardsley area, Arizona*, W. G. Harper and F. O. Youngs.—The area surveyed comprises 181,760 acres in the central part of Maricopa County, south-central Arizona. The lands included form part of a "smooth-surfaced, gently sloping valley plain, almost unbroken by topographic irregularities." The regional drainage, provided by the Gila River, is good, but the surface drainage is more variable. Mohave sandy loam leads a list of 23 types of 6 series with 14.9 per cent of the total area. Laveen sandy loam follows with 11.2 per cent, and Mohave loam occupies 10.2 per cent. The unclassified materials consist of 4.2 per cent of river wash, and rough broken land amounting to 0.6 per cent.

[Soil chemistry studies in Alabama] (*Alabama Sta. Rpt. 1928, pp. 10–12*).—These studies continue earlier work (E. S. R., 60, p. 121).

The nature of soil buffer action with special reference to the exchangeable complex, W. H. Pierre.—Soil buffer action showed itself largely in the colloidal fraction; and colloids having a high sesquioxide ratio exhibited a buffer

capacity much higher than that of soil colloids in which the ratio was lower. "Thus, the specific buffer capacity, determined between pH 4.5 and 6.5 of a colloid obtained from a gray silt loam from Illinois was found to be 13.8, while that of a fine sandy loam from Alabama was only 6.6. The $SiO_2:R_2O_3$ values of these colloids were 2.78 and 1.17, respectively. A study of a large number of soils from several States showed a close correlation between the buffer action and their total exchange capacity."

Methods for determining the amounts of lime required to bring soils to definite pH values, W. H. Pierre.—"The buffer capacity of the soil toward a base can be determined in the laboratory by the 'dialysis colorimetric' method. A three-day period of contact between the soil and $Ba(OH)_2$ was found to be sufficient for the establishment of equilibrium. The amounts of lime necessary to bring potted soils to definite pH values were found to be higher than the amounts of base required in the laboratory. The relation between the two values . . . was found to be quite uniform for various soils," the factor being approximately 1.5 when the soils were brought to pH values below neutrality. "Liming soils in accordance with their content of exchangeable hydrogen brought the soils to pH values of approximately 6.5."

The concentration of organic and inorganic phosphorus in the soil solution and soil extracts and the availability of the organic phosphorus to plants, W. H. Pierre and F. W. Parker.—"The displaced soil solutions of 21 soils from 9 States were found to have an average of 0.09 p. p. m. of inorganic and 0.47 p. p. m. of organic phosphate. The 1:5 soil extracts of the same soils gave an average concentration of 0.35 p. p. m. inorganic and 0.22 p. p. m. organic phosphate," and it was shown by absorption experiments that "plants would not absorb organic phosphate from soil extracts or the displaced solution, [although] the plants absorbed all of the inorganic phosphate present. . . . The growth in the various extracts was almost proportional to the inorganic phosphate present."

The adjustment of the reaction of indicator solutions and its importance in determining the hydrogen-ion concentration of slightly buffered solutions, W. H. Pierre and J. F. Fudge.—"Indicator solutions made up without neutralization, solutions adjusted to pH 7.0 and those made up according to Clark, give erroneous results with slightly buffered solutions. For such solutions the indicator solutions are shown to require adjustment to a pH corresponding to about the middle of the transition interval." The authors observed the reduction of indicators in using the hydrogen electrode and used the quinhydrone electrode for pH measurements in indicator solutions.

The adsorption of the anions of acid dyes by soil colloids, J. G. Smith and P. L. Gile (*Jour. Agr. Research [U. S.], 41 (1930), No. 5, pp. 401–413*).—The U. S. D. A. Bureau of Chemistry and Soils here reports a study of the adsorption capacity of soils of which the colloids represented widely different silica-sesquioxide ratios for sodium carminate, Orange II, and Ponceau (C. I. number not stated). From aqueous solution the acid dyes named were adsorbed very slightly or not at all. From solution N/2,000 acid the adsorption figures were larger than in the case of the purely aqueous solutions but were still negligibly small. From N/20 acid solution Ponceau was removed by some of the soils in large quantities; but the removal of the dye in this case was found to be in all probability "a precipitation of the dye with bases dissolved from the soil colloids rather than a true adsorption.

"It is concluded that the true adsorption of anions of the acid dyes by soil colloids is negligible, like that of the simpler anions. The comparatively large adsorptions of acid dyes reported by several earlier investigators are ascribed to the use of colloidal dyes and to precipitations of the dyes by acid or by

bases released from the soil colloids. The apparent lack of adsorptive capacity for anions is discussed in its relation to the nature of the surface exposed by soil colloids."

Growth of turf grasses and weeds in relation to soil acidity, J. W. White, F. J. Holben, and C. D. Jeffries (*Pennsylvania Sta. Bul. 258 (1930), pp. 18, 19*).—It is reported that "on the unlimed soil the mercury compounds reduced the activity of the nitrifying organisms an average of 35 per cent; on the limed soil, 2 per cent. Lead arsenate stimulated nitrification on the unlimed soil; on the limed soil it caused a slight depression. Soil respiration was somewhat reduced on both the limed and unlimed soil, in the mercury treatments. The arsenate treatment stimulated soil respiration on the unlimed soil and depressed it 11 per cent on the limed soil. . . .

"Under sod, nitrification is a limiting factor. The common practice of golf greens management is to create an acid soil condition as a means of weed control. Under such conditions nitrification is still further reduced. The application of mercury compounds complicates this soil condition by further depressing the activity of the nitrifying organism. On the limed soil, however, mercury had no significant harmful effect."

The quality of clover and timothy hay as influenced by soil acidity, J. W. White and F. J. Holben (*Pennsylvania Sta. Bul. 258 (1930), p. 16*).—Plats laid out in 1881 and cropped without liming showed the exhaustion of the supply of residual lime, first in the failure of the clover crops, then in reduced yields of other crops, and finally in an invasion of the plats by sorrel and other acid-resistant plants "which soon greatly influenced the yields and quality of the clover and timothy hay." The conclusion here drawn was that "these results indicate that soils deficient in lime are unable, even with liberal fertilizer treatment, to produce hay of good quality. Lime with manure produced 16 per cent more total clovers in the hay mixture and 29 per cent more red clover than the hay produced with manure alone."

The comparative values of various green manures in the formation of soil nitrates and available humus, J. W. White (*Pennsylvania Sta. Bul. 258 (1930), pp. 15, 16*).—A comparison, consisting essentially in the mixing into the soil of the green immature residues of various crops at the rate of 20 tons of dry matter to the acre, is here reported. "The experiment was carried out in large glass jars kept in the dark for nine months. At the end of this period the organic matter and soluble humus were determined. The soil nitrates were determined at regular intervals." The nitric nitrogen results represented the average pounds per acre found in the soil for a period of eight months, and the humus and organic matter figures the amount at the end of nine months.

"Red clover was the most effective leguminous green manure. Among the nonleguminous residues, rape was most effective in supplying soluble nitrogen and wheat in supplying humus and organic matter. The action of the two classes of crop residues is quite similar, since young, immature grasses contain a high percentage of nitrogen, equal in some cases to the amount in the leguminous plants."

The production of artificial farm manures, F. B. Smith, W. H. Stevenson, and P. E. Brown (*Iowa Sta. Research Bul. 126 (1930), pp. 165–195, figs. 5*).—The work reported covered in detail the use of various reagents in composting and the effect of such compounds and mixtures on the rate and character of the decomposition of the straw (rate of decomposition having been measured by the rate of production of carbon dioxide, the rate of loss of nitrogen, and the composition of the product), the effects of aeration and of inoculation on the decomposition of straw, and the production of artificial manures on the farm. A brief bibliography concludes the paper.

From among the findings recorded the following examples may be cited: "These experiments on the production of artificial farm manure show that a good grade of well-decomposed manure may be made by composting straw or cornstalks with certain chemicals, provided a sufficient supply of water is added to keep the compost heap moist. The addition of a proper amount of water is essential for the best decomposition of the materials and for the production of the best grade of manure. . . .

"The results obtained in the greenhouse indicate that too much aeration may be very undesirable in the making of artificial manures, decreasing the decomposition processes and causing a considerable loss in nitrogen. A certain degree of aeration, however, is very beneficial in the decomposition of various composts. A proper relationship between the amount of water and the aeration must be established and maintained to secure the best results. . . .

"Inoculation of composts with fresh manure, soil, or cultures of molds may speed up the decomposition process. The results of the experiments carried out along this line, however, as reported here, indicate that with an even temperature, optimum moisture conditions, and the best aeration, decomposition of composts prepared with various chemical reagents will proceed quite rapidly, and good artificial farm manures may be produced without any inoculation.

"It seems very desirable that some reagent supplying soluble nitrogen be employed in preparing composts from straw, cornstalks, or other similar materials, in order to hasten the decomposition processes, and permit of the earlier production of a well-decomposed manure. Such a reagent will also increase the fertilizing value of the manure produced because of the nitrogen added. Artificial farm manure may be produced by composting straw and such materials without the addition of any reagents, but the process proceeds much slower and the manure formed is of less value when applied to the soil. . . .

"The practice of making artificial farm manure can not be recommended for general farm use, but where conditions are favorable and the facilities are available at little cost, artificial farm manure may be produced which will be equal in value to farm manure and will serve to supplement the inadequate supply of that important fertilizing material."

Soils and crop experiments, A. T. Wiancko and G. P. Walker (*Indiana Sta. Circ. 172 (1930), pp. 3–8, fig. 1*).—Studies at the Moses Fell Annex Farm, Bedford (E. S. R., 62, p. 22) indicate that "phosphorus is by far the most important plant food need of this soil. Applications of superphosphate have been highly profitable, either alone or in addition to manure. Without manure . . . 225 lbs. of 16 per cent superphosphate for corn and wheat in the 4-year rotation have produced average crop increases of 16.9 bu. of corn, 6.9 bu. of soybeans, 6.8 bu. of wheat, and 1,159 lbs. of hay per acre, valued at $36.85 for the rotation at a cost of $5.04 for the fertilizer. On land receiving an average of 6.8 tons of manure for corn, a similar use of superphosphate has further increased the crop yields by 10.1 bu. of corn, 5.9 bu. of soybeans, 5.8 bu. of wheat, and 1,202 lbs. of hay, worth $30.13, at a cost of $5.04 for the phosphate, showing that manure is not sufficient on this land. . . .

"Manure applied at an average rate of 5.5 tons per acre for the corn has produced average crop increases of 16.7 bu. of corn, 2.5 bu. of soybeans, 2.5 bu. of wheat, and 454 lbs. of mixed hay per acre, valued at $20.10, which amounts to an average return of $3.64 per ton of manure applied. . . .

"Ground limestone applied at the rate of 3 tons per acre in 1917 has so far produced average crop increases of 3.7 bu. of corn, 1.8 bu. of soybeans, 1.7 bu. of wheat, and 521 lbs. of mixed hay per acre, valued at $33.34, up to the present time. . . .

"Lime and manure together have produced average increases of 20.4 bu. of corn, 4.6 bu. of soybeans, 3.9 bu. of wheat, and 775 lbs. of mixed hay per acre, amounting to $29.81 for the rotation."

The effect of mixed fertilizers appeared to be principally that of the phosphate content. On limed land superphosphate was more profitable than rock phosphate, but without either lime or manure and on manured land without lime, rock phosphate was the more profitable.

Response of buckwheat to fertilizers and manure on Volusia soils, J. W. White and C. D. Jeffries (*Pennsylvania Sta. Bul. 258 (1930), p. 17*).—On one of the two experiment fields here reported upon, rock phosphate was more effective than was superphosphate. On the other "the averaged results . . . indicate that liberal dressings of phosphate fertilizers have been more profitable than when potash and nitrogen were added to superphosphate. These results are in accord with the present farm practice of fertilizing buckwheat."

The value of blast furnace slag as a source of agricultural lime, J. W. White and C. D. Jeffries (*Pennsylvania Sta. Bul. 258 (1930), p. 18*).—The authors report results from 217 plats of Dekalb and Volusia soils under a variety of rotations.

"The laboratory studies include the value of slag in correcting soil acidity and the resultant formations of soil nitrates. In the field experiments on Dekalb soil, slag and limestone have been compared on the basis of equal weights of material. Since the spring of 1929, the fine materials are compared on the basis of equal units of lime oxides (CaO—MgO). The granulated slag is applied in amounts equivalent to 2, 4, 6, 8, and 10 tons per acre of pure limestone ($CaCO_3$)." On the basis of an average of figures for the three soils, "fine slag has a value in the production of soil nitrates of 89 per cent of that of pulverized limestone. The granulated slag shows results considerably below that of limestone."

AGRICULTURAL BOTANY

The inter-relation between silicon and other elements in plant nutrition, W. E. Brenchley, E. J. Maskell, and K. Warington (*Ann. Appl. Biol., 14 (1927), No. 1, pp. 45–82, pl. 1, figs. 3*).—In view of the possibilities of reducing the quantities of phosphate or potassic fertilizers by means of silica compounds as suggested by the work of other investigators, experiments were undertaken at Rothamsted to determine whether the use of silicates supplementary to other forms of fertilizers might be economical.

Under controlled conditions in water cultures soluble silicate had little effect upon the growth of barley when phosphorus also was present, but when this was absent a significant increase in dry weight was induced. The addition of silicate caused an appreciable increase in the height of the main shoot, which was most marked in the phosphate-free solutions, becoming less evident as the quantity of phosphate was increased. Leaf development was retarded by phosphate deficiency and hastened by silicate addition. A close association exists between the amount of phosphate and the effect of silicate upon tillering rate and number.

Soil cultures with barley and mustard in pots with various forms of silicate showed soluble silicates to be more active than glass silicates, tending to increase dry weight with deficient mineral manuring, and in some cases also with complete manuring. Other soil experiments showed variations in the response of barley and mustard to silicate on different soil types. A general improvement occurred with increasing doses of silicate together with combinations of manures, notably when phosphorus or potash was deficient. The sig-

nificance of the results has been examined statistically and an attempt made to formulate the effect of added silicate in terms of an increase in the efficiency of the superphosphate present.

The injection of sulfates into Valonia, L. R. BLINKS (*Jour. Gen. Physiol., 12 (1928), No. 2, pp. 207, 208*).—Cells of *V. macrophysa*, ordinarily free from sulfate in the vacuolar sap, occasionally show the presence of this ion. In order to determine directly its effect, experimentation was performed in 1924 on 30 cells, an amount of sap about equal to one-eighth of the cell's volume being withdrawn and replaced later with sufficient 0.6 M KCl, group A, or 0.4 M K_2SO_4, group B, to restore turgidity, and the contents of the surviving cells being tested two weeks later for sulfate ion. All the cells were turgid and appeared otherwise normal.

Group A gave no reaction for sulfate, while group B gave a strong one (approximately as much as the surrounding sea water). Supposedly, the protoplasm can tolerate a considerable amount of sulfate on the vacuolar as well as on the outer surface. Sulfate, although ordinarily absent from the sap, is not rapidly eliminated when present. Hence, it is thought, the sulfate occasionally found in cells apparently normal may owe its presence to temporary injury followed by recovery.

The death wave in Nitella, I, II, W. J. V. OSTERHOUT and E. S. HARRIS (*Jour. Gen. Physiol., 12 (1928), No. 1, pp. 167–186, figs. 23; 12 (1929), No. 3, pp. 355–361, figs. 8*).—Considering in part 1, applications of like solutions, the expectation, based on previous experience, that the current of injury in the large cell of Nitella will be positive when the cell is in contact with concentrated solutions (as KCl at 0.1 M) and negative when the cell is in contact with dilute solutions (as KCl at 0.001 M) has been found to be justified by experimentation. This also supports the view that protoplasm is made up of layers differing considerably in their properties, each having a death curve of simple and regular form, the more rapid alteration of the outer layer making the protoplasm more positive and the more rapid alteration of the inner layer making it more negative.

From the point where the cell is cut a wave, here called death wave, passes along the cell, setting up at each point passed a death process which has the greater speed and intensity the nearer it is to the cut.

In part 2, applications of unlike solutions, the hypothesis of protoplasmic layers is said to make it possible to predict the bioelectrical behavior of the cell under conditions ranging over a great variety. It is claimed to have been shown that this is clearly the case when a death wave passes through different points in contact with unlike solutions.

Internal versus external toxicity in Valonia, A. G. JACQUES and W. J. V. OSTERHOUT (*Jour. Gen. Physiol., 12 (1928), No. 2, pp. 209–219, figs. 3*).—Bioelectric measurements having indicated that in Nitella and Valonia the protoplasm consists of layers, of which the inner is more sensitive to chloroform than is the outer (the layers being in contact with the same electrolytes at equal concentrations), experimentation was attempted to determine the relative sensitivity of these layers by applying a toxic agent to each one separately. For this purpose $MnCl_2$ was chosen and was applied by an improved technic, which is detailed. All cells were stabbed in the same manner with the capillary tubes.

When $MnCl_2$ was injected into the cells they lived only about half as long as when it was applied to the exterior. The explanations offered in considerable variety all involve a difference between the inner and the outer layers of the cell protoplasm.

Dark adaptation and the light-growth response of Phycomyces, E. S. Castle (*Jour. Gen. Physiol., 12 (1929), No. 3, pp. 391–400, figs. 4*).—A single-celled, elongating sporangiophore of Phycomyces responds to a sufficient increase of illumination intensity, increasing briefly in its growth rate, this being the so-called light-growth response dealt with in a series of reports by Blaauw (E. S. R., 42, p. 128). The reaction time is made up of an exposure period and a latent period, during which the plant may be kept in darkness and will yet react at its end. Both light adaptation and dark adaptation occur in the sporangiophore. "The kinetics of dark adaptation can be accounted for on the basis of a bimolecular reaction, perhaps modified by autocatalysis. Attention is called to the bimolecular nature of the 'dark' reaction in all other photosensory systems that have been studied, in spite of the diversity of the photosensitive substances themselves and of the different forms of the responses to light."

Kinetics of photosynthesis in plants [trans. title], J. C. Ghosh (*Jahrb. Wiss. Bot., 69 (1928), No. 4, pp. 572–586, figs. 3*).—This purports to be a theoretical interpretation of the data presented by Harder (E. S. R., 49, p. 127) regarding carbon dioxide assimilation in Fontinalis.

Bio-chemical decomposition of cellulosic materials, with special reference to the action of fungi, R. D. Rege (*Ann. Appl. Biol., 14 (1927), No. 1, pp. 1–44, pls. 4, figs. 8*).—As sources of the main carbon constituents of plants, classified as celluloses, hemicelluloses, starches, sugars, pentosans, and lignins, two materials differing as to decomposability were selected as representative for detailed study. Of these, rice straw is rapidly decomposable, while poplar wood is difficultly attacked by microorganisms.

Pentosans form in mature plant materials the most important food for microorganisms, being easily attacked. The other furfural-yielding compounds are found to be resistant, and it is essential to get a correct figure for pentosans. The method suggested as possible is to determine the furfuroids.

Regarding the two factors, the food or energy factor, which is the pentosans, and the physical or inhibitory factor, the lignin, it is found that if the ratio of energy factor to inhibitory factor is above 1, the material is easily decomposed; but if it is below 0.5 the material is very resistant to microbial attack. The prediction of the decomposability of a material is thus possible.

"Attempts to increase this ratio in resistant materials by the addition of carbohydrates proved unsuccessful. It was concluded that since microorganisms obtained their food materials outside the tissues, they did not attack the tissues until the more easily available foodstuffs were exhausted. Thus the decomposition of the material was actually less than was possible under natural conditions. Mannose and galactose do not appear to form suitable food for the microorganisms concerned in these processes, and it is concluded that the pentosan part of the hemicelluloses is most important as microbial food."

It is shown that under the conditions of the experiments fungi play a more prominent part, especially during the early stages of such decomposition. The nitrogen of the fungal bodies proved to be of the resistant type.

The ability of certain fungi isolated from such decomposing heaps to grow at high temperature as well as on purified carbon constituents of plants, and also the presence of almost all the enzymes necessary to hydrolyze the complex carbon constituents, further confirm their importance.

Measurement of electrical potential of plant tissue and of single cells [trans. title], J. Gicklhorn and K. Umrath (*Protoplasma, 4 (1928), No. 2, pp. 228–258, figs. 6*).—Among the studies here particularized are measurements of the differences in potential of anatomically and physiologically different plant tissues.

Electrical potential of plant tissue [trans. title], K. UMRATH (*Protoplasma, 4 (1928), No. 4, pp. 539–546*).—This account of an extension of the work above noted gives data and conclusions from studies of *Musa sapientum* (various parts), *Hedera helix*, and *Tulipa* sp.

The penetration of strong electrolytes, W. C. COOPER, JR., M. J. DORCAS, and W. J. V. OSTERHOUT (*Jour. Gen. Physiol., 12 (1929), No. 3, pp. 427–433*).—This paper deals primarily with penetration, incidentally also with flotation. The fact that strong electrolytes enter cells of Valonia very slowly unless these are injured, together with the fact that the protoplasm shows very high electrical resistance, suggests that the electrolytes may enter largely as undissociated molecules formed at the surface of the protoplasm by the collision of ions.

In sea water, the specific gravity of which has been increased by CsCl, cells of Valonia were floated for over a year with little or no penetration of Cs except as the result of injury. The penetration of NH_4Cl decreases the specific gravity of the sap and causes the cells to float, while they live indefinitely. It is suggested that if the sea contained a little more ammonia Valonia would be a floating organism.

The electrical conductivity of protoplasm, S. GELFAN (*Protoplasma, 4 (1928), No. 2, pp. 192–200*).—"The determination of the electrical conductivity of protoplasm not only establishes a physical property of living matter, but the solution of other problems in cell physiology may be simplified by an accurate knowledge of this property."

Determination was made of the specific conductance of the protoplasm (apart from the cell membrane) of *Amoeba proteus, Euplotes, Spirostomum teres*, Frontonia, of the plant cell Nitella, and the starfish oogonia, and it was found that the conductivities of all these forms, except the starfish eggs, vary from one that is equivalent to a 0.01 N KCl solution to one that is equivalent to a 0.06 N KCl solution, the average being equivalent to about a 0.05 N KCl solution. It is pointed out that the conductance of the protoplasm is not affected by the viscosity. This with other evidence is advanced as indicating a micellar structure of protoplasm.

The chlorophyll decomposing agent in the rinds of Satsuma oranges, W. A. GARDNER (*Alabama Sta. Rpt. 1928, p. 20*).—Acids in the rinds of Satsuma oranges were found to hasten the decomposition of the chlorophyll in the same manner as did catalysts. Great difficulty was found in separating the effects of acids from those enzymes. Colorimetric determinations of the H-ion concentration were impossible because of the brown and yellow pigments which could not be removed by dialysis. Potentiometric determinations of various lots of water extracts of the rinds gave pH values ranging from 4.2 to 4.7.

The physiology of lactescence [trans. title], M. ROEBEN (*Jahrb. Wiss. Bot., 69 (1928), No. 4, pp. 587–635, figs. 2*).—These studies, designed to develop, as an important end, methods of working with small quantities of milky plant juices so as to permit repetition of the operations under different conditions, include studies on colorant solutions and of lithium salts; on dry matter content of latex as related to atmospheric humidity and to carbon dioxide assimilation; the influence of different materials on dry matter in latex; the influence of external conditions on the electrolyte content of latex; and a comparison of electrolytes in latex with those in expressed juice.

On the mechanism of enzyme action.—I, a study of zymase fermentation with contributions to a theory of enzyme "activation," F. F. NORD and K. W. FRANKE (*Protoplasma, 4 (1928), No. 4, pp. 547–595, [pl. 1], figs. [10]*).—The second communication, to which this is preliminary, has been noted (E. S. R., 60, p. 310). In experiments carried out with two carefully

selected yeasts in a chemically pure dextrose solution, a physical method was found, which is outlined, for the preparation of a permanently active zymase solution.

Premature tuber formation of potatoes [trans. title], J. G. O. Botjes (*Tijdschr. Plantenziekten, 33 (1927), No. 1, pp. 1–13, pls. 2; Eng. abs., pp. 11, 12*).—Citing the views and findings of Wellensiek, some of which have been noted (E. S. R., 52, p. 645; 54, p. 724; 55, p. 25), regarding the causation of premature tuber formation, the author describes as the result of experimentation a very simple way to cause the tubers to take in water during the sprouting process.

In wet sand roots very quickly develop, supplying the driest tubers with sufficient water. If the shoots be repeatedly removed, potatoes of all varieties tried (Eersteling, Present, Dutch Triumph, and Bravo) form premature tubers, this phenomenon occurring at temperatures as high as from 15 to 20° C. (59 to 68° F.).

Changes in the tuber resulting from repeated removal of sprouts apparently cause premature tuber formation. This occurrence has been studied on the hypothesis that not loss of water but a change in the proportion of albuminoids and carbohydrates may result from the removal of the young shoots. These are shown to contain a great quantity of albuminoids, from two to four times as much as is found in the mother tuber and much more than in the dry substance of the young tubers. There is, supposedly, some ground for the belief that after repeated removal of sprouts the growing points of the shoots suffer a shortage of albuminoids sufficient to hinder the formation of young tissue. After repeated removal of sprouts only weak shoots resulted. This weakness in shoot formation may prevent the sufficient utilization of abundant carbohydrates for cellulose formation. A deposit in the form of starch, with resultant tuber formation, may be the actual sequence.

The drier the tubers are kept, the smaller the loss that is suffered through sprout formation. Dry storage helps somewhat to dry out the tubers, this possibly favoring tuber formation. On the other hand, in dry storage less loss of shoots takes place. Experimentation with Eersteling and Bravo shows that premature tuber formation occurs earlier in case of tubers stored in damp than in those stored in dry quarters. Light, dryness, and low temperature in storage all tend to inhibit sprout formation, and these are regarded as the most important means of guarding against premature tuber formation.

Plant material introduced by the Office of Foreign Plant Introduction, Bureau of Plant Industry, April 1 to June 30, 1929 (*U. S. Dept. Agr., Inventory 99 (1930), pp. 46*).—A total of 792 new accessions introduced into the United States for trial is recorded, with brief descriptions in many instances.

GENETICS

Short branch, another character of cotton showing monohybrid inheritance, T. H. Kearney (*Jour. Agr. Research [U. S.], 41 (1930), No. 5, pp. 379–387, figs. 2*).—On a plant found in 1924 in a field of Pima Egyptian cotton in Arizona, the fruiting branches were reduced to a single internode which was leafless or practically so. The character was expressed uniformly in the inbred descendants during four generations. According to observations into the F_2 of a cross between a "short branch" plant and a plant of an inbred Pima family having normal fruiting branches with usually five or more internodes the expression of short branch depends upon a single factor, and there is no dominance in respect to this character. Other pairs of allelomorphs for which

there is fairly conclusive proof of monohybrid segregation in certain cotton crosses are listed.

The genetics of the genus Phlox, J. P. Kelly (*Pennsylvania Sta. Bul. 258 (1930), p. 23*).—It is reported that no single type of hereditary transmission of the extra petaled characteristic of annual phlox was found. The manner in which extra petaledness affected the F_1 and F_2 generations depended primarily on the strain with which mated.

Physiology of the corpus luteum, IV–VI (*Amer. Jour. Physiol., 91 (1929), No. 1, pp. 14–18, figs. 4; 92 (1930), Nos. 1, pp. 174–178, figs. 4; 3, pp. 612–618, figs. 4*).—A continuation of earlier studies (E. S. R., 62, p. 126).

IV. *The production of artificial deciduomata with extracts of the corpus luteum,* L. A. Goldstein and A. J. Tatelbaum. The authors conducted two experiments which confirmed the observation that the corpus luteum produces a special hormone which has for one of its functions the sensitization of the uterine mucosa resulting in the production of deciduomata following indifferent stimulation of the endometrium at the proper period of the sexual cycle. Guinea pigs were used as the experimental animals.

V. *The preparation and some chemical properties of progestin, a hormone of the corpus luteum which produces progestational proliferation,* W. M. Allen.—The name "progestin" is proposed for the hormone of the corpus luteum which brings about the histological and physiological state in the endometrium in spayed rabbits characteristic of early pregnancy.

Detailed directions are given for an approved procedure for the preparation of the hormone of the corpus luteum, which in brief involves the removal of the corpora lutea of sows, grinding, preserving in 95 per cent alcohol, filtration, extraction of the residue with hot alcohol, distillation of the alcohol at a low temperature, extraction of residue with peroxide-free ether, precipitation with acetone and an alcoholic solution of magnesium chloride, distillation, solution of residue in ether, and centrifuging and evaporation of ether.

It appears that the hormone progestin is destroyed by alkalies, but the purified product is not destroyed by mild acid hydrolysis nor is it associated with cholesterol color reactions. It is relatively stable to heat and mild oxidation. The oily preparations may be preserved in ethyl alcohol for long periods without loss of potency.

VI. *The production of progestational proliferation of the endometrium of the immature rabbit by progestin (an extract of the corpus luteum) after preliminary treatment with oestrin,* W. M. Allen.—In three series of experiments it was found that injections of progestin in immature rabbits would not produce progestational proliferation, but 10 immature rabbits injected with oestrin and then progestin showed the characteristic progrestational proliferation of the endometrium.

Physiology of corpus luteum.—VII, Maintenance of pregnancy in rabbit after very early castration, by corpus luteum extracts, W. M. Allen and G. W. Corner (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 5, pp. 403–405*).—To test the possibility of maintaining normal pregnancy in ovariotomized rabbits the ovaries were removed from females 18 hours after mating and corpora lutea extracts were administered daily. Four females receiving from 0.2 to 0.5 cc. continued to parturition at the twenty-ninth, thirty-second, twenty-eighth, and thirty-second day, respectively. Two other rabbits failed to give birth to their young on the thirty-third day, but examination showed the presence of dead fetuses. In all but one of several cases which failed to go through normal gestation it was found that the extracts of corpora lutea employed were impotent.

The simultaneous production of two hormones by the corpus luteum, R. T. FRANK, R. G. GUSTAVSON, H. MCQUEEN, and M. A. GOLDBERGER (*Amer. Jour. Physiol., 90 (1929), No. 3, pp. 727–729*).—Two hormones were separated from 610 gm. of the pink type of corpora lutea obtained from 5 lbs. of sows' ovaries. One of the fractions was ether-soluble, while the other was the ether-insoluble portion of an aqueous solution. Biological tests showed that although the aqueous fraction would not induce the production of deciduomata when silk threads were passed through the uterine walls of castrated rats, it nevertheless produced the reaction of the symphysis pubis in guinea pigs when administered at full oestrum. The ether-soluble fraction produced a strong positive oestrum in castrated rats as judged by vaginal smears.

Hormone content of human ovarian tissues, E. ALLEN, J. P. PRATT, Q. U. NEWELL, and L. J. BLAND (*Amer. Jour. Physiol., 92 (1930), No. 1, pp. 127–143*).—The oestrum-producing hormone content of isolated tissues of human ovaries was tested by injections of fresh follicular fluid and by implantation of fresh corpora lutea, follicle walls, and cortical stroma free from visible follicles, using ovariotomized rats as experimental animals.

Yields of the hormone as high as 23 rat units were obtained from fresh corpora lutea removed from the thirteenth to the seventeenth day of the menstrual cycle. The amount of hormone present in the corpora lutea decreased by the twentieth to twenty-second day. During the first third of gestation the amount of hormone present in the corpora lutea was also high, but it decreased as gestation advanced so that two full term corpora lutea did not show the presence of any of the hormone. The follicles and follicle walls contained considerable amounts of the hormone, and large yields were obtained from the cystic follicles in two cases of long continued bleeding. In one case of ammenorrhea large amounts of the fluid from cystic follicles gave negative results. Studies with ovarian stroma also gave negative results.

Attention is called to the fact that as in monkeys the removal of large follicles or recent corpora lutea from women results in menstruation within 48 hours.

Relation of the follicular and corpus luteum hormones in the production of progestational proliferation of the rabbit's uterus, F. L. HISAW and S. L. LEONARD (*Amer. Jour. Physiol., 92 (1930), No. 3, pp. 574–582, figs. 10*).—By removing the ovaries from rabbits and treating with extracts of corpora lutea alone or following administration of the follicular hormone, it was demonstrated that both hormones were needed for bringing about progestational proliferation of the endometrium characteristic of pseudopregnancy. The follicular hormone is necessary to bring the uterus into a condition of oestrum.

The mechanism of ovulation in the rabbit, I, II, M. H. FRIEDMAN (*Amer. Jour. Physiol., 89 (1929), No. 2, pp. 438–442, figs. 6; 90 (1930), No. 3, pp. 617–622, figs. 6*).—Two papers are here given.

I. *The demonstration of a humoral mechanism.*—Ovulation was not interfered with in four animals by the removal of both Fallopian tubes, the uteri, and the vagina except for that portion caudad to the bladder. In 15 other animals the ovaries were removed and small pieces introduced into a scarified area in the rectus muscle. Thirteen of these females so operated upon accepted coitus from 5 to 17 weeks later, and in 9 of these from 1 to 4 corpora hemorrhagica were found, the conditions observed in the ovaries up to 10 hours after ovulation simulating those of the normal ovary. Since ovulation occurred in the transplanted ovaries, it may be assumed that the process is not dependent upon the action of ovarian nerves, but is dependent on a humoral mechanism. If afferent impulses from the sensory nerves of the vagina play a

part, such impulses must come from the small portion of the vagina between the neck of the bladder and the external orifice.

II. *Ovulation produced by the injection of urine from pregnant women.*—It was found impossible to produce ovulation in the rabbit by the transplantation of 15 fresh rat hypophyses or the intraperitoneal injection of 24 rat hypophyses, but the intraperitoneal injection of urine from pregnant women produced luteinization of the corpora hemorrhagica and a single intravenous injection of urine from pregnant women produced ovulation in the rabbit. Urine from nonpregnant women was without effect on the rabbit.

Pseudopregnancy in the albino rat, J. R. SLONAKER (*Amer. Jour. Physiol., 89 (1929), No. 2, pp. 406–416, figs. 5*).—The average duration of 475 cases of pseudopregnancy was 14.53 days as measured by the time from coitus to the next oestrum. It was found that pseudopregnancy followed matings of normal males with hysterectomized females and of vasectomized and castrated males with normal females, and that pseudopregnancy could also be induced, but with less regularity, by artificial stimulation of the cervix uteri. It is suggested that the persistence of the corpora lutea is not caused by a direct nerve impulse to the ovaries, but that it is more likely brought about by a hormone secreted by the mucosa of the vagina or uterus.

The heterogeneous testis transplant problem as applied to white rats and mice, G. CRISLER (*Amer. Jour. Physiol., 90 (1929), No. 3, pp. 623–630, figs. 5*).—An account is given of attempts to transplant testes of young adult white mice into the scrotum of adult white rats after removing the left testis and stitching the mouse testis to the tunica vaginalis. In 43 animals grafts were recovered for study after 159 to 185 days. Histological studies of the recovered grafts showed that in 9 the grafts were not definitely located or connective tissue had entirely replaced the tubules. In 27, occasional areas of the old epithelium were present, and these cells were frequently arranged to give the appearance of tubules separated by large areas of connective tissue. In 6 the graft was slightly or not invaded by connective tissue. The tubules while easily recognized showed profound degeneration, but sperm heads were present in some. In one graft the epithelium appeared to be living, though the tubules presented signs of retrogression. It was considered that none of the grafts were completely established.

FIELD CROPS

[Agronomic investigations in Alabama, 1928], R. Y. BAILEY, H. B. TISDALE, F. E. BERTRAM, W. A. GARDNER, J. F. DUGGAR, and C. L. ISBELL (*Alabama Sta. Rpt. 1928, pp. 6–9, 10, 20, 24, 26*).—Varietal and improvement studies with corn and cotton (E. S. R., 62, p. 732) in different sections of the State, rotation experiments including the current and period responses of crop yields to legumes (E. S. R., 63, p. 525) and to fertilizers, fertilizer trials with cotton, seeding tests with oats, and storage and variety tests with sweetpotatoes are reviewed as in earlier reports (E. S. R., 60, p. 129).

In the Cullars rotation, which includes both summer and winter legumes turned under before cotton and corn are planted, rock phosphate produced about the same yields of corn and oats as superphosphate, whereas superphosphate treatment resulted in an average annual yield of 82 lbs. of seed cotton per acre more than rock phosphate for the period 1911–1927. In a test of sources of phosphorus, cotton receiving superphosphate averaged for seven crops 937 lbs. of seed cotton per acre, rock phosphate 825 lbs., and no phosphate 617 lbs. As to nitrogen sources, cotton manured made 1,287 lbs. of seed cotton

per acre, receiving sodium nitrate 1,092 lbs., after vetch turned under 1,340 lbs., and unfertilized 390 lbs. The respective acre yields of corn on the same treatments were 27, 31.2, 32, and 6.8 bu. The rate of fertilizing cotton has been reported on earlier (E. S. R., 61, p.130).

Practically all kinds of vetches, clovers, alfalfas, and other winter legumes reached the blooming stage in much shorter time from winter and late fall planting than from early fall planting. The yields, however, rapidly decreased as the planting date was postponed.

During the growth of sweetpotatoes a gradual decrease was observed to occur in the percentage of moisture, a gradual increase in starch and sucrose, and no increase in reducing sugars. Removal of tops about six weeks before general harvest induced an increase in moisture content and a corresponding decrease in carbohydrates. Uncured Porto Rico sweetpotatoes contained more moisture and less starch and sucrose than the cured ones. Cured sweetpotatoes stored, not ventilated, under humid conditions contained a higher percentage of moisture and sucrose and less starch than those under dry conditions. When no ventilation and humid ventilation were compared for cured sweetpotatoes in a humid atmosphere, the moisture and sucrose contents were higher and the starch lower in those not ventilated, and this also was the case when no ventilation and dry ventilation were compared with cured, dry stored sweetpotatoes. Respiration was high in unventilated sweetpotatoes. There usually was more difference in respiration between ventilated and not ventilated than between either cured and uncured sweetpotatoes, or those stored under the driest and most humid not-ventilated conditions.

[Crop experiments at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 172 (1930), pp. 8–11, 20, 21, figs. 3*).—Continued experiments (E. S. R., 62, p. 30) reported on embraced varietal trials with winter wheat, rye, and barley, oats, and soybeans, and fertilizer trials with pasture and tobacco.

[Field crops experiments in Kentucky, 1929] (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 15, 16, 18–22, 45–47*).—Tobacco topped early as soon as the bud appeared and kept closely suckered throughout the season yielded about 30 per cent more than the average where the so-called labor-saving practices were followed, although the heavy yield was associated with a dark-colored leaf, averaging about 5 cts. less per pound than the other tobacco. Of the other practices referred to, permitting one or two top suckers to grow seemed to save little labor but gave an exceptionally good quality of leaf. Late topping and delaying the removal of suckers saved much labor and resulted in about as good yield and as good quality as leaving two suckers. Tobacco not topped or suckered until harvest made low yields and rather large percentage of inferior leaf. Mulch paper apparently did not benefit tobacco.

The use of 500 lbs. per acre of fertilizer approximating 3–10–6 increased the yield of tobacco at the Western Kentucky Substation, as an average of 3 years, from 775 lbs. per acre unfertilized to 1,222 lbs. A further increase of 120 lbs. per acre came from the use of 1,000 lbs. Limestone with the same quantity of superphosphate as of the complete fertilizer and 10 tons of manure on each crop increased the yield from 777 lbs. unfertilized to 1,307 lbs.

Frequent cutting enough to maintain a reduced top growth resembling that from pasturing did not affect significantly the stand of sweetclover, although it resulted in plants with small root systems. Cutting for hay at any time during the summer again resulted in restricted root development and sometimes in reduced stands. The cutting of August 27, 1929, was the most harmful of the season, resembling results in former years. Late September cutting had little

or no harmful effect. Microchemical tests indicated that the relative food contents in roots is similar, regardless of the time of removing tops. The important effect from cutting for hay appeared to be the restriction of the development of the root system.

Adapted Kentucky strains of red clover in the 1928–29 crop decidedly outyielded native northern, and strains from western States by a still wider ratio. Foreign clovers on the whole failed completely, although French clover gave a good hay crop in a test in western Kentucky.

Vegetation, on land at the Western Kentucky Substation pastured by yearling Hereford steers, on an untreated field producing 405 lbs. of gain consisted of several kinds of weeds, redtop, orchard grass, and lespedeza; on the rock phosphated field making 1,605 lbs. of gain almost wholly of redtop, orchard grass, and lespedeza, the lespedeza furnishing most of the pasturage during the latter part of the summer; and on the field receiving lime and superphosphate making 1,645 lbs. the vegetation was almost wholly sweetclover, orchard grass, and redtop, while during the latter part of the season orchard grass and redtop, together with a little lespedeza, furnished the grazing.

The individual and average yields of corn, soybeans for hay, wheat, clover, and tobacco variously limed and fertilized in rotations on soil experiment fields in the State are tabulated. At Campbellsville no advantage came from applying 100 lbs. of sodium nitrate in the hill instead of broadcasting, whereas at Lexington on land long unmanured or unfertilized the acre application of 125 to 250 lbs. of complete fertilizer all in the hill was much more effective than all broadcasted.

The progress of corn breeding work is noted briefly.

Some rotation experiments at the Ohio Agricultural Experiment Station, Wooster, Ohio (*Ohio Sta. Spec. Circ. 31 (1930), pp. 4*).—A brief account of the yields and values of the crops in some of the more important rotations at the station is given for the period 1919–1929, inclusive. The highest average annual values for the rotation were returned by the 2-year rotation, corn, wheat, with sweetclover sown in the wheat to be plowed under for corn, $44.87; the 3-year rotation, corn, wheat, alfalfa, $45.69; and the 4-year rotation, corn, corn, wheat, and red clover, $40.60.

[**Field crops research in Pennsylvania**], D. E. Haley, O. Olson, F. G. Merkle, C. F. Noll, and C. J. Irvin (*Pennsylvania Sta. Bul. 258 (1930), pp. 8, 14, 15, 19, 20*).—No marked correlation was found between the quantity of potassium applied to cigar filler tobacco and the potassium content of the leaves in cooperative experiments with the U. S. D. A. Tobacco Investigations. The use of potassium sulfate did not seem to affect the percentage of sulfur in the leaves, whereas the calcium content of the plants remained relatively high under all treatments. An excessive quantity of potassium lowered yield somewhat and did not improve taste, aroma, and combustion. However, it appeared that growers for best results should apply at least 150 lbs. of potassium per acre instead of the 70 to 100 lbs. used currently. The progress of breeding work with high nicotine strains of *Nicotiana rustica* and low nicotine strains of Pennsylvania Seedleaf and Havana Seed is noted.

In tests to determine the merits of frequent cultivation during summer drought as a means of conserving moisture and thereby increasing yields, cultivating often (eight times) did not result in an increased moisture content of the surface and subsoil. Capillary moisture movement was slow enough to prevent rapid evaporation, whether the surface was mulched or not; nor was the quantity of available plant foods, nitrates, and total soluble salts increased by frequent cultivation. The soil temperature generally was slightly

warmer on the uncultivated soil than on that cultivated. The yields of corn, potatoes, beans, and mangels averaged nearly the same whether cultivated eight or three times, or not at all. The results thus far indicated that, for the Hagerstown soil series and probably for most other upland soils of Pennsylvania, cultivation need be practiced only often enough to control weeds.

A basic mixture of timothy, red clover, and alsike clover, variously supplemented by Kentucky bluegrass, redtop, smooth bromegrass, or meadow fescue with white clover or Ladino clover was seeded in 1912 on ⅜-acre plats of Hagerstown clay loam, which received superphosphate at planting and ground limestone in 1915. Annual observations on the botanical composition of the pasture revealed that in a few years Kentucky bluegrass and white clover were nearly as abundant on the check plats as on those where sown. They now comprise the important part of the pasture. Red clover and Ladino clover practically disappeared after a few years, and alsike lasted a few years longer. Meadow fescue and smooth bromegrass have gradually disappeared. Orchard grass has persisted but does not form over 10 per cent of the pasture, and it is closely grazed and has not bunched. Where redtop was sown it is very abundant, constituting one-third to one-half of the pasture, and is spreading to adjacent plats.

Grimm, Cossack, Baltic, and Ladak alfalfas showed winter hardiness, whereas Chilean and Peruvian sorts were injured severely. Alfalfa from southern California and Arizona as a rule has not been winter hardy. Hardy varieties considerably outyield common alfalfas.

Fertilizer and crop rotation experiments, T. E. ODLAND, S. C. DAMON, and J. L. TENNANT (*Rhode Island Sta. Bul. 224 (1930), pp. 42, figs. 3*).—The progress of investigations with crop rotations and fertilizers (E. S. R., 45, p. 529) is reviewed for 1921 to 1929, inclusive, and results obtained in previous years are summarized. The work in a number of the years reported was under the direction of B. L. Hartwell.

The rotations considered include B, potatoes, hay 4 years, corn; C, potatoes, rye, hay; D, potatoes, rye, hay, corn; E, potatoes, rye, hay, hay, corn; F (no legumes), potatoes, rye, hay, hay, corn; and G, potatoes, corn, hay 5 years. Certain plats also were designed to give information on the fertility needs of the rotations. Several changes have been made in both crops and fertilization since the previous report.

Satisfactory yields of all crops were maintained without the use of stable manure in the rotations receiving no manure. The average yield of corn on rotations B, D, E, and F ranged from 63 to 70 bu. per acre for the period. Rotations B, D, and E yielded practically the same, while the nonlegume rotation F yielded about 10 per cent less than the others, at least partly due to the reduction in nitrogen applied to the corn in this rotation. The yield of Green Mountain potatoes ranged from an average of 320 bu. on rotation E to 368 bu. on rotation D, and averaged 332 bu. per acre on rotation F. Rye on the rotations E and F averaged for the period 26 and 22 bu. per acre, respectively, the difference probably being due to the fact that rotation F receives less nitrogen for the rye crop than E. Rye cut green for hay on rotation D averaged 4.68 tons per acre. In average yield, first-year hay ranged from 2.62 tons per acre on rotation F to 4.15 tons on rotation D. On rotation E it was 3.68 tons. The second year of hay averaged 3.34 tons on rotation E and 2.69 tons on rotation F. The most gain from including legumes in the rotation was realized on the hay crops. The net annual returns were estimated to be $18.97 per acre for rotation F, $26.34 for E, $38.92 for D, $40.78 for B, and $56.75 for C.

In the fertilizer studies two different quantities of phosphorus and two of potassium were compared in a 7-year rotation. Reducing the phosphorus in the fertilizer by 50 per cent did not reduce the yields of potatoes or hay but did result in a smaller yield of a following crop of corn, although no fertilizer was applied directly for corn. Con yielded as well on the low potassium plat as on the high potassium plat, but the yields of both the potatoes and hay were considerably decreased by reducing this ingredient in the fertilizer. Alfalfa and clover responded very markedly to additional potassium.

Where different quantities of phosphorus and potash were used, results obtained were similar to those obtained in the above rotation. Potatoes and hay responded to potassium, whereas rye and corn were more or less indifferent to potassium but were influenced by the additional phosphorus. Plats where different quantities of nitrogen were applied showed a definite increase in yield as the nitrogen was increased for all crops except potatoes. In 1929 the heavy application of nitrogen proved decidedly harmful to this crop.

When several rates of the same complete fertilizer were applied, indications were that from 700 to 1,000 lbs. of a 4–8–7 fertilizer probably is enough for corn. Increases in potato yields sufficient to pay for the additional fertilizer were obtained up to maximum application of 1 ton per acre. Rye did not pay for quantities exceeding 700 lbs. Hay yields increased up to the maximum application of 1,400 lbs., but the increase in yield from applications beyond 1,050 lbs. was hardly profitable.

The chemical composition of grass from plots fertilized and grazed intensively in 1929, J. G. Archibald (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 6, pp. 491–501, figs. 7*).—Samples of grass from nine 8-acre pasture plats that were fertilized and grazed intensively at the Massachusetts Experiment Station were analyzed and the results compared with those obtained in the previous year, 1928 (E. S. R., 62, p. 131).

Fertilization was found to decrease the dry matter content of the grass; in the dry matter the crude fiber content dropped, whereas all other constituents determined were increased, especially the nitrogen. The acre production or recovery of all constituents was increased, about twice as much nitrogen being recovered as on the unfertilized check.

The 1929 results are held to substantiate and strengthen the earlier conclusions in regard to the increase in nutritive value due to fertilization, the absence of any appreciable effects of treatment in smoothing out seasonal fluctuations, and the changes in the chemical composition of the grass as the season advanced. The amount of rainfall appeared to be the most important of the factors which produce marked seasonal fluctuations in the chemical composition of grass.

Size of list quadrat for use in determining effects of different systems of grazing upon Agropyron smithii mixed prairie, H. C. Hanson and L. D. Love (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 7, pp. 549–560, figs. 2*).—The most suitable size of quadrat for use in studying differences in the abundance and frequency of species in adjacent pastures grazed by two different methods, the Colorado Experiment Station observed, appears to be 2 square meters lying adjacent to each other.

Varietal tests with wheat, oats, barley, rye, and buckwheat, M. M. Hoover and R. J. Garber (*West Virginia Sta. Bul. 237* (*1930*), *pp. 12, figs. 2*).—Results of varietal tests at the station (1921–1929) and at Lakin (1923–1929) indicated as outstanding Fulhio, Reliable 80, and Trumbull winter wheats; Gopher oats; Rosen rye; Alpha barley; and Japanese buckwheat.

Small grain varieties in Minnesota, H. K. Wilson and A. C. Arny (*Minnesota Sta. Bul. 264 (1930), pp. 83, figs. 4*).—Varieties of spring wheat, winter wheat, oats, barley, and rye are indicated as desirable for Minnesota from comparative tests during various periods at the station and substations. Brief descriptions, agronomic data, and, for wheat, the results of milling and baking tests are tabulated and discussed.

The recommended or outstanding varieties include Marquis, Marquillo, Ceres, and Mindum (durum) spring wheat; Minturki winter wheat; Minota, Victory, Anthony, and Gopher oats; Improved Manchuria, Minsturdi, Velvet, Glabron, and Svansota barley; and Swedish No. 2 rye.

Alfalfa as a rotation crop, P. E. Miller and R. O. Bridgford (*Minnesota Sta. Bul. 265 (1930), pp. 18, figs. 11*).—To determine the most profitable sequence of both corn and grain crops following alfalfa, three different 4-year rotations were run from 1915 to 1929 on 4-year-old alfalfa sod on Clarion silt loam at the West Central Substation at Morris.

The rotation of corn, wheat, corn, barley, following alfalfa, gave very satisfactory returns for all crops, and the same was true for the rotation of wheat, corn, corn, barley, although wheat as the first crop in the rotation yielded almost 4 bu. less than it did as the second crop in the rotation. The third rotation, barley, corn, corn, barley, was not so advantageous as far as the first year of barley was concerned, there being a difference of about 14 bu. per acre in the yield of barley, depending upon its place in the rotation.

For climatic conditions resembling those at the substation, the results suggested that corn is the most satisfactory crop to follow alfalfa. Corn apparently is affected less than wheat or barley by the depleted reserve of subsoil moisture. The later years of the rotation obviously are the place for grain crops following alfalfa. The results also showed that it is quite possible to use alfalfa as a rotation crop.

Fall-sown oat production, T. R. Stanton and F. A. Coffman (*U. S. Dept. Agr., Farmers' Bul. 1640 (1930), pp. II+20, figs. 9*).—Superseding Farmers' Bulletin 1119 (E. S. R., 44, p. 37), this discusses the adaptation and advantages of fall-sown oats, outlines cultural and harvesting practices, describes winter oats varieties, and indicates the merits of the crop for hay and grazing.

Sources of nitrogen for potato fertilizers in Aroostook County, B. E. Brown, F. V. Owen, and E. R. Tobey (*Maine Sta. Bul. 354 (1930), pp. 38, pls. 7, figs. 2*).—Comparisons of nitrogenous fertilizers for potatoes during 16 years in Aroostook County, principally on Caribou loam, are reported on jointly by the U. S. D. A. Soil Fertility Investigations and the station.

Ammonium sulfate, during the 16 years, produced a higher average yield than sodium nitrate, although comparative results between the two materials seemed to depend largely upon seasonal conditions. The major effects of seasonal variation appeared to be the leaching of sodium nitrate during periods of heavy rainfall and the unavailability of ammonium sulfate during drought, especially on very acid soils.

Supplying part of the nitrogen in organic form generally did not produce a great increase over all in inorganic salts. Fertilizer mixtures containing some organic nitrogen did prove superior in certain years with heavy rainfall early in the growing season. While the results indicated that the increasing use of inorganic nitrogen to replace partly the higher priced organic nitrogen is justifiable under Aroostook County conditions, it seemed doubtful whether all organic nitrogen should be excluded, since certain organic materials render the fertilizer mixture more drillable and supply some slowly available nitrogen, insuring against abnormal seasonal conditions.

From 5 to 6 per cent of ammonia (4.1 to 4.9 per cent of nitrogen) in the mixture gave best results on the Caribou loam soil. The need for nitrogenous material in potato fertilizers was shown by the much lower yields resulting from mixtures containing only phosphorus and potassium than from a complete fertilizer.

As single sources of nitrogen, urea, Leunasalpeter, ammonium nitrate, ammonium chloride, ammonium phosphate, and calcium nitrate compared favorably with ammonium sulfate and sodium nitrate. Cyanamide also gave good results when the quantity used did not exceed 60 lbs. per ton of mixed fertilizer, although injury resulted in 1921 and 1922 with higher proportions. Cyanamide produced comparatively good results when used as the sole source of nitrogen in 1927, 1928, and 1929 and applied to the soil separately from the other fertilizer constituents.

The reaction of the soil and its ability to hold moisture, important factors in determining the effectiveness of various nitrogen materials, were found to vary somewhat among the soils used for growing potatoes in Aroostook County.

Potato spraying and dusting, D. Folsom (*Potato Assoc. Amer. Proc., 15 (1928), pp. 305–309; abs. in Maine Sta. Bul. 353 (1929), p. 148*).—A review of the literature in this field.

The production and storage of sweet potatoes, J. C. C. Price (*Mississippi Sta. Bul. 279 (1930), pp. 20, figs. 11*).—Information on varieties, bedding, soils, planting, cultivation, spacing, cutting vines, fertilizers, and storage of sweetpotatoes is presented, largely from the results of experiments at the station and substations. Sweetpotato insects and diseases are discussed briefly, and plans are given for a new type of basement-heated storage house.

Triumph and Porto Rico led the varieties in yield and keeping quality. Medium-size, smooth, sound sweetpotatoes should be used for bedding. Considering costs of plants and production, 15 in. appeared to be the most satisfactory spacing for plants. Heavy cutting of vines for use instead of slips for late planting resulted in fewer and smaller sweetpotatoes, but it appeared that 25 per cent or less of the vines could be cut and used profitably. Fertilizer is not recommended on heavy soil types like those of the station, but is indicated on the light sandy soils of south Mississippi and the brown loam type of central and northern Mississippi.

A preliminary report of the relation between yield of winter wheat and moisture in the soil at seeding time, A. L. Hallsted and E. H. Coles (*Jour. Agr. Research [U. S.], 41 (1930), No. 6, pp. 467–477, figs. 6*).—The relation of the moisture content of the soil at seeding time to the yields of the following crop of wheat was studied at the Fort Hays, Kans., Substation in cooperation with the U. S. D. A. Office of Dry Land Agriculture. Moisture determinations were made from 1910 to 1928 in a large number of plats involving different cropping systems and tillage practices. The present report is based on the first 3 ft. of soil.

A moisture content of 20 per cent or more in the upper 3 ft. of soil at seeding time at Hays practically precluded a crop failure because of drought, although failure might result from hail, flood, or other conditions. This seemed of practical value for discouraging a large acreage when the moisture supply is materially below 20 per cent and for emphasizing the need for practices which conserve the most moisture in the soil. In the period of these studies it was possible to conserve by fallowing as much as 20 per cent of moisture in the upper 3 ft. of soil in 226 of 253 cases, for wheat after wheat in 35 of 92 cases, for wheat after corn in 14 of 55 cases, and for wheat after kafir in 2 of 22 cases. When the soil moisture content is

much below 20 per cent in the surface 3 ft. at seeding time the chances of securing a large crop appeared to be much less, and the chances for harvesting a small crop or having a failure to be increased measurably. With about 15 per cent of soil moisture the crop practically depends on rainfall after seeding.

The data presented may be of certain value for forecasting yields, yet they are considered principally useful as a means of determining when chances for a crop are reasonably good and when they are largely dependent on factors other than stored moisture. "The smaller the quantity of stored moisture at seeding time the more dependent is the crop on the weather during the growing season and the greater are the chances of a failure."

Milling and baking qualities of world wheats, D. A. Coleman, O. L. Dawson, A. Christie, H. B. Dixon, H. C. Fellows, J. F. Hayes, E. Hoffecker, J. H. Shollenberger, and W. K. Marshall (*U. S. Dept. Agr., Tech. Bul. 197 (1930), pp. 224, figs. 8*).—Milling and baking tests were made on samples of 412 varieties of wheat representative of commercial types grown in 38 of the wheat-producing countries of the world and also upon samples representing 431 cargoes of export wheat. Data in regard to the commercial classification of these wheats and milling and baking properties, and statistics concerning the production, distribution, and consumption of wheat are given for each country, and the milling and baking characteristics are summarized. Most of the wheats were grown in the crop year 1926 and some in 1927, and in general were considered representative of an average crop year. For several reasons continued study over a series of years appeared unlikely to prove more useful than the study of the samples of one crop year.

Consideration of the milling and baking data from the analysis of the world's wheat led to the conclusion that while milling quality, i. e., the ability to produce a large quantity of high-grade flour from the minimum quantity of wheat, is a factor in determining the relative standing of quality of the wheats, it is the baking quality of the flours milled from these wheats that sharply differentiates them.

Among the hard red spring wheats the higher grades of Canadian wheat led in milling value, although from a baking viewpoint flours milled from hard red spring wheats grown in the United States were equally good. Russian spring wheats appeared to be somewhat deficient in baking strength compared with those grown in North America and South America. Spring wheats grown in northern Europe, e. g., Norway, Sweden, Germany, Latvia, and Poland, and in the Union of South Africa, though usually of good milling value, were somewhat deficient in baking strength, whereas Uruguay produced wheat very good in this respect.

The best quality of durum wheat came from Russia, Canada, and the United States, the product of other durum-growing countries being very noticeably deficient in baking strength.

The best quality of hard red winter wheat, both as to milling and baking, was produced in the United States. It surpassed that grown in Argentina in milling value, although in baking quality the flour milled from Argentine wheat was fair. The flour from the Russian hard red winter wheat appeared to lack baking strength and those from Bulgaria and Hungary did not appear quite so strong as Argentine wheats of similar classification.

Soft red winter wheats grown in the United States, while not equal in milling quality to some wheats of this class grown elsewhere, always excelled in baking quality. Those produced in the United Kingdom, as well as those grown in most of continental Europe, were of average to above-average milling quality but were decidedly lacking in baking quality. Only European Russia, Hungary,

and the lower Danube countries had soft red winter wheats with fair-to-average baking qualities as well as milling quality.

White wheats grown in India, Australia, and the United States ranked in milling quality in the order named. Flours milled from white wheats produced in the United States and Australia were of about the same baking strength, surpassing the flours from the white wheats of India. Mexico, Russia, Poland, Chile, Morocco, and the Union of South Africa also produced white wheat of good baking strength, while those from other parts of the world were much below average in this respect.

Poulard wheat (*Triticum turgidum*) is popular in the warm and dry areas of southern Europe, Asia, and northern Africa; however, results of tests on poulard wheat samples from Egypt, Italy, Palestine, Portugal, and India were always below the average of any of the other classes of wheat studied.

HORTICULTURE

[**Horticultural investigations at the Alabama Station**] (*Alabama Sta. Rpt. 1928, pp. 24–26, 27*).—Studies by C. L. Isbell of the chemical composition of fruiting and vegetative shoots of the pecan, the results of which are presented in tabular form, showed a higher content of total nitrogen and a lower content of total carbohydrates in current season wood than in 1-year-old shoots. Pecan nuts kept well for a year when stored in an ordinary fruit and vegetable chamber at a temperature fluctuating around 32° F. and with a high humidity. As a result of a test of 36 varieties of peaches Isbell reports that the June Elberta, Illinois, and Augbert have considerable merit.

Cabbage fertilizer studies conducted by R. W. Taylor and Isbell with plants set out in December were in favor of a complete mixture. Nitrate of soda used alone gave a low proportion of marketable heads. Superphosphate and nitrate of soda produced a high yield but with a smaller proportion of early maturing heads than in the complete fertilizer lot. Sulfate of ammonia as a source of nitrogen gave very solid heads but low total yields. The use of 1,000 lbs. of nitrate of soda was better than either 500 or 1,500 lbs.

Data reported by W. D. Kimbrough on the effect of fertilizers on the qualities of strawberries indicated that climatic conditions had more effect on the moisture and sugar content of berries than did fertilizer. No consistent variation was noted in respect to fertilizer treatment. In similar studies with vegetables, potatoes fertilized with sulfate of potash contained no more starch than did those fertilized with muriate. Fertilizer had no apparent effect on keeping quality. With watermelons, fertilizers had no apparent influence on moisture or sugar content or on keeping quality. Sugar content decreased rather rapidly in melons stored at room temperature. Cucumbers contained approximately 96 per cent of moisture and had a relatively high respiration rate, but these factors and keeping quality were not significantly affected by fertilizer treatment. Cabbage without applied potash developed a physiological trouble characterized by wilting of the leaves at the time of heading.

Horticultural experiments [at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 172 (1930), pp. 11–15, figs. 3*).—In presenting the usual annual report (E. S. R., 62, p. 38), information is presented on the operation and cost of a new stationary spray plant installed in the spring of 1930. In preparation for a study of pear blight control resistant rootstocks were grafted with the Old Home variety. A fine growth of clover and grasses resulted from broadcasting sulfate of ammonia in the apple orchard. Storage studies conducted by C. E. Baker and I. D. Mayer again showed that

icing aids in keeping apples past the flush of the harvest season, although market conditions in 1929 were such that little profit was made by holding fruit.

[**Horticultural investigations at the Kentucky Station**] (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 37–40*).—The usual annual report (E. S. R., 62, p. 227).

The Long Island strain of Golden Acre cabbage, the Penn State Earliana tomato, and the World Beater pepper were found outstanding.

In soil reaction studies the highest yields of both tomatoes and lettuce were secured in the pH range 7.5 to 8.5. The use of sodium carbonate to build up alkalinity gave marked increases in yield. An increased yield occurred on the acid side compared with checks in the pH range 5.5 to 6.5 but did not equal the increases found on the alkaline side. Nitrate and total nitrogen were low on the acid range and high on the alkaline. Lime-treated soil on the alkaline side contained comparatively small amounts of soluble manganese and phosphorus and a larger amount of nitrate than did the checks, while the sodium carbonate treatment resulted in slightly larger amounts of active manganese and phosphorus than did the checks and a much larger nitrogen content. Soluble manganese was evidently present in toxic amounts in the acid plats above 5.5 pH. The high yield of plats treated with sodium carbonate is explained in part by the abundance of nitrogen and soluble phosphorus and the moderate amount of soluble manganese present. The large nitrogen content of plats treated with calcium and sodium is deemed the result of the activity of nonsymbiotic nitrogen-fixing bacteria stimulated by the alkaline reaction. Strawberry plants in sand cultures grew best when the soil reaction was between pH 5.3 and 5.5. Reactions of pH 3 and pH 9 inhibited growth, with extreme acidity the more toxic. The reaction most favorable to growth induced the greatest fruitfulness.

Mulch paper gave good results with beans, tomatoes, cucumbers, squash, and muskmelons.

The Young dewberry, the Latham raspberry, and the Plum Farmer and Quillen black raspberries were all found valuable. Time-of-thinning studies with Elberta peaches showed the most benefit from thinnings 57 days after petal fall. Thinnings 88 days after petal fall gave little increase in size. The Golden Jubilee peach, and the Wild Goose, Archduke, Kahinta, and Gonzales plums proved promising.

Control of fire blight gave good results in early blooming pears but not in apples which bloomed during a cool, wet period.

[**Report of the department of horticulture**] (*Pennsylvania Sta. Bul. 258 (1930), pp. 31–34, figs. 2*).—Again reporting (E. S. R., 62, p. 338) on soil fertility studies in apple orchards, R. D. Anthony states that soils with high organic matter content retained much more water in the surface soil in the dry summer of 1929 than did soils with little organic matter. As a result, cover crops made good growth on the high organic matter plats and perished on the low plats. The growth of the cover crop is considered a fairly reliable index to future growth and fruiting of the trees. A combination of nitrogen and phosphorus increased cover crop growth and through this the yield of fruit. Sowing cover crops early in June instead of July caused no injury to the trees and gave good results where sufficient moisture was present to support the cover crop. Applications of large quantities of nitrogen fertilizers to bluegrass growing under apple trees greatly stimulated the bluegrass but had a harmful effect on the apples.

Selection studies by M. T. Lewis with lettuce resulted in strains of the Big Boston and New York varieties that appeared well adapted to Pennsyl-

vania. Promising seedlings were obtained from a cross of the New York and Hanson varieties.

A list of promising new vegetable varieties is offered by W. B. Mack.

A. P. Tuttle established the fact that differences in fertilizer treatments other than application of barnyard manure had no apparent effect on organic matter or moisture contents of the soil. The correlations between humus, moisture content, and crop yields were very high, suggesting that any practice which increases humus also increases soil moisture and yields.

Studies by C. E. Myers of 62 plant selections of the Penn State Ballhead cabbage showed high uniformity but considerable variation in susceptibility to blackleg. Seedlings from open-pollinated sister plants varied materially in susceptibility, and the permanence of susceptibility was doubted in the fact that one lot of cabbage most resistant in 1927 was least resistant in 1929, and vice versa a susceptible lot became quite resistant.

Principal varieties of garden vegetables approved for registration and variety names adopted by the Horticultural Committee of Canadian Plant Breeders at Winnipeg, 1929, C. Sweet (*Canada Dept. Agr. Pamphlet 111, n. ser.* (*1930*), *pp. 12*).—Tabulated lists are included.

Effect of moisture supply on development of Pyrus communis, A. F. Barss (*Bot. Gaz.*, *90* (*1930*), *No. 2*, *pp. 151–176*, *figs. 11*).—In this second contribution to the problem (E. S. R., 32, p. 638) the author in addition to continuing the discussion of the results of controlling the water supply upon gross characters of the pear, such as growth, flower and fruit production, etc., reports upon the results of histological studies carried on at the University of Chicago upon the tissues of the different lots of trees. The greatest difference was in the extent of the xylem area, the proportion in the trees receiving large, medium, and scanty amounts of water being 15, 2, and 1, respectively. The pith cells were practically identical in all lots, irrespective of water supply, and the cortex was largest in the moderately watered trees. Apparently in the pear a great development of xylem is possible in response to increased water supply without resulting in succulent growth. It is concluded that water plays a definite rôle in the metabolism of the tree.

Development and ripening of peaches as correlated with physical characteristics, chemical composition, and histological structure of the fruit flesh.—II, Histology and microchemistry, R. M. Addoms, G. T. Nightingale, and M. A. Blake (*New Jersey Stas. Bul. 507* (*1930*), *pp. 19*, *figs. 11*).—As one of a series of papers (E. S. R., 63, p. 41) dealing with the general problem, this presents the results of a study of the histology and microchemistry of peach fruits. Two varieties, Elberta and Shipper Cling, were used in the study and in the case of the Elberta further subdivided by the use of fruit from high and low vegetative trees. The results of a study of Elberta fruits from flower to maturity are set forth in detail. No evidence was found of a differentiated middle lamella in any of the cells of the flesh, except in the comparatively thick walled subepidermal region, leading to the conclusion that if pectates are present they occur in extremely small amounts. The authors believe that cell walls in the flesh consist of an intimate association of cellulose and insoluble protopectin. Protopectin was not uniformly distributed but was concentrated in areas of the cell wall exposed to the intercellular spaces rather than to the walls of adjacent cells. Chloroplasts were most abundant in the outer portion of the flesh. The pigment giving yellow color to mature peach flesh is thought to belong to the carotinoid group. Reducing sugars in appreciable but variable quantities were present at all stages of fruit development whereas sucrose increased greatly as ripening proceeded. As Elberta

fruits reached the soft ripe stage the outermost flesh cells became round and their cell walls thin.

Concerning differences between fruits of high vegetative and low vegetative trees, cut surfaces of the low vegetative fruits browned more quickly at all stages, due apparently to a higher content of tannin. Fruits of the low vegetative trees ripened earlier, and consequently on certain dates had thinner cell walls and lower cellulose and protopectin content than those of the vegetative trees.

Up to the hard ripe stage there was little difference between Elberta and Shipper Cling peaches, but with maturation Elberta flesh cell walls thinned rapidly, whereas those of Shipper Cling thinned but slightly. At the stage of complete maturity there was little difference between varieties in respect to percentage of cellulose, but Shipper Cling had more than 100 per cent more insoluble protopectin. The cells of the outer flesh layers of Shipper Cling failed to thin greatly or round up at final maturity, and there was no rupture of cell walls with exudation of cell contents into the intercellular spaces. Checking up with other varieties, it was quite apparent that Elberta and Shipper Cling represented the melting and nonmelting types.

Identification of cultivated raspberries, J. D. Winter (*Minnesota Sta. Tech. Bul. 66 (1930), pp. 14, figs. 4*).—Discussing the botany of the cultivated raspberry and the characters used in distinguishing species and varieties, a key is presented to 16 horticultural varieties, as follows: Loudon, June, Sunbeam, Chief, Eaton, Latham, Viking, Ranere, King, Otha, Golden Queen, Cuthbert, Herbert, Columbian, Older, and Cumberland. The most useful characters in varietal identification were the presence or absence of glands on the petiole, peduncle, pedicel, and calyx, whether these glands were stalked or sessile, the form of leaflets on young canes, the bristles on the young cane, petiole, peduncle, pedicel, and calyx, particularly the quantity of bristles on the petiole and the color at their base, and finally fruit characters.

Strawberry varieties, J. C. C. Price (*Mississippi Sta. Circ. 93 (1930), pp. 4, figs. 2*).—This comprises brief notes on growth, productivity, and the character of the berries.

Effect of fertilizers on cranberry land, C. S. Beckwith (*New Jersey Stas. Bul. 501 (1930), pp. 16, figs. 3*).—A summary of investigations, the progress of which has been regularly discussed in the annual reports of the station (E. S. R., 63, p. 340).

Cranberry bogs are located on three types of soil, namely, mud bottom, iron ore bottom, and savannah soil, the last of which includes approximately one-half of the New Jersey production. Mud bottoms can not be safely treated with commercial fertilizer unless very low in fertility and then only at intervals. Iron ore bottoms when vine growth is poor may be treated advantageonsly every 4 to 5 years with 500 lbs. of complete fertilizer per acre. On savannah land nitrate of soda was more effective than dried blood during the first 5 years of the trials, but dried blood gave the larger gains later. A special cranberry fertilizer made up of 75 lbs. of nitrate of soda, 75 lbs. of dried blood, 300 lbs. of rock phosphate, and 50 lbs. of sulfate of potash is recommended for annual use on medium savannah soils, with larger quantities of the same proportions on poor soil. Evidence was obtained that fertilizers increase the size of cranberries and decrease the decay in stored fruit.

Papaya culture in Hawaii, W. T. Pope (*Hawaii Sta. Bul. 61 (1930), pp. 40, figs. 30*).—A general discussion upon various features of papaya growing, including botany, propagation, methods of culture, harvesting and marketing, control of pests, composition and uses of the fruit, and on the collection and preparation of papain.

Growth habits of the pecan, C. L. ISBELL (*Natl. Pecan Growers Assoc. Proc., 27 (1928), pp. 60–82, figs. 41*).—Material herein presented has been previously noted (E. S. R., 59, p. 531).

Flowering and fruiting habit of the pecan, J. G. and N. C. WOODROOF (*Natl. Pecan Assoc. Proc., 28 (1929), pp. 128–140, figs. 9*).—A discussion upon the physiology of the formation and development of the flowers of the pecan. Varieties naturally divided themselves into two groups according to the characteristic of the catkins at the time of pollen shedding. No difference between groups was observed up to early fall, when complete differentiation of anthers and bracts occurred in one group, while in the other no differentiation took place until spring. Reduction division occurred about 21 days before pollen shedding, and the chromosome number was tentatively determined as 12.

Pollen shedding processes are again discussed (E. S. R., 57, pp. 439). Generally pecan pollen was highly viable, the Pabst variety having less than 5 per cent of defective grains in 1928 and 1929, while the Centennial and Mantura had slightly more than 19 per cent. Vigor of tree and environment had some effect on viability of pollen. Pollen stored at either 23 or 22° C. (73.4 or 71.6° F.) in dry atmosphere failed to germinate after 24 hours, but other lots remained viable for 48 and 72 hours, respectively, under moist conditions. Stored dry at 5°, pollen remained viable for 48 hours and at 5° moist for 96 hours. No condition was found under which pollen could survive more than 96 hours with certainty of germination. The optimum germination temperature was about 23°.

The morphological differentiation of the pistillate flowers of the pecan, D. V. SHUHART (*Natl. Pecan Growers Assoc. Proc., 26 (1927), pp. 108–118, figs. 12*).—A popular presentation of material previously noted (E. S. R., 57, p. 439).

Looking through the pecan, D. V. SHUHART (*Natl. Pecan Assoc. Proc., 28 (1929), pp. 183–191, figs. 12*).—A discussion of the anatomical structure of the pecan shoot and buds.

Pecan root observations and their relation to cultural practice, J. L. PELHAM (*Natl. Pecan Growers Assoc. Proc., 27 (1928), pp. 130–138, figs. 8*).—Careful excavation and washing of the roots of 27-year-old pecan trees showed a large number of upright feeding roots reaching toward the surface from deeper primary roots rather than a lateral system close to the surface.

Variety tests with pecans in North Carolina, C. D. MATTHEWS (*Natl. Pecan Assoc. Proc., 28 (1929), pp. 147–151*).—Tabulated data are presented on the results of variety tests at the Lower and Upper Coastal Plain Stations. Sweetmeat was the most productive variety at both places over the 16 years covered, but Stuart, Schley, Alley, Success, Pabst, Moneymaker, and Curtis are deemed the best varieties, particularly the first two listed.

The work of the Bureau of Chemistry and Soils with pecans: The relation of soil fertility and commercial fertilizers to pecan production, J. J. SKINNER (*Natl. Pecan Growers Assoc. Proc., 26 (1927), pp. 52–63*).—The planting of summer and winter cover crops increased in a 5-year period the organic matter of the soil of a pecan grove from 1.1 to 2.5 per cent and the nitrogen content from 0.031 to 0.061 per cent. At the same time the removal of a summer cover crop in comparable areas reduced the organic matter from 0.62 to 0.49 per cent with some loss in nitrogen. Yields rose in the first area and declined sharply in the second.

Measurements in a block of unfertilized Success trees showed gains in circumference of 1.5, 2, and 2.75 in. in the fifth, sixth, and seventh years, respectively, as compared with gains of 3, 3, and 3.25 in. for fertilized trees. The unfertilized produced 1.2 lbs. of nuts per tree in their seventh year as compared

with 8 lbs. for the fertilized trees. The importance of nitrogen in the fertilizer was seen in better growth and larger yields of the nitrogen trees in direct proportion to the quantity of nitrogen applied. Mixtures high in nitrogen produced larger and better filled nuts containing 3 to 4 per cent more protein than did nuts from nonnitrogen trees. Potash apparently had an increasing influence on oil content and lightened the color of the meat. In concluding, the author suggests that a complete fertilizer is needed in the pecan orchard and presents certain formulas based on the results of the investigations.

The dropping of pecans, J. G. and N. C. Woodroof (*Natl. Pecan Growers Assoc. Proc., 27 (1928), pp. 28–34, fig. 1*).—A presentation of information previously noted (E. S. R., 60, p. 542).

Daffodils, D. Griffiths (*U. S. Dept. Agr. Circ. 122 (1930), pp. 74, figs. 50*).—This is a comprehensive discussion on the production of narcissus bulbs and flowers, being in substance a revision of Bulletin 1270 (E. S. R., 52, p. 239) and containing information on the more recent developments, such as hot water treatment of bulbs for the control of pests, etc.

Water gardens, A. Laurie (*Ohio Sta. Bimo. Bul. 147 (1930), pp. 195–198, figs. 2*).—This comprises popular information on the construction of water gardens and notes concerning plant materials for use therein.

Horticultural exhibitions, F. L. Mulford (*U. S. Dept. Agr., Misc. Pub. 85 (1930), pp. 37, figs. 14*).—A revision of the previously noted circular (E. S. R., 42, p. 346) and in a like manner presenting information useful in the staging and management of horticultural displays.

FORESTRY

[Report of the department of forestry] (*Pennsylvania Sta. Bul. 258 (1930), pp. 29–31, fig. 1*).—In discussing the toxic effect of black walnuts on other species, J. A. Ferguson states that toxicity may be due to conditions produced in the soil by black walnut roots or possibly to intensive root competition.

As reported by A. C. McIntyre, commercial fertilizers gave good results when applied to coniferous seed beds. In nearly all cases white and pitch pine and Norway spruce seedlings grown on fertilized soil were larger and heavier than those grown in control areas.

Measuring volunteer white and pitch pine seedlings growing in scrub oak stands, it was found that on the average the seedlings occurring under one-fourth shade were 29.6 in. tall, whereas under half, three-fourths, and full shade the seedlings averaged, respectively, 11.2, 8.1, and 7.3 in.

Soil temperatures taken at four stations over a one-year period showed that forest covers reduce fluctuations. Preliminary work on seed loss by rodents gave the comparative losses as much the heaviest in the open field and practically equal in scrub oak and dense white pine stands.

Rate of growth of second-growth southern pines in full stands, R. D. Forbes and D. Bruce (*U. S. Dept. Agr. Circ. 124 (1930), pp. 77, figs. 11*).—In connection with a series of volume, yield, and stand tables for loblolly, longleaf, shortleaf, and slash pines, a general discussion is presented of timber growing and land use in the Southern States. It is estimated that there is a total of over 102,000,000 acres of cut-over pineland in the South, much of which is now idle and as such constitutes a burden to the owner and the community. Fire and heavy taxation are said to be serious obstacles to timber growing, despite which a few landowners have planted pines. The importance of the pine forests in sustaining lumber production and the naval stores industries is stressed. Appended are data on the methods employed in the growth studies and a discussion of the international log rule.

Effect of certain climatic factors on the diameter growth of longleaf pine in western Florida, J. E. Lodewick (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 5, pp. 349–363, figs. 7*).—Studies in the Choctawhatchee National Forest, Fla., showed no relation between temperature and wood production in the longleaf pine. However, in most cases a marked reduction or increase in rainfall was accompanied by a corresponding variation in the width of the annual rings. Precipitation during the period of spring wood formation showed a fair qualitative correlation with width of the spring wood, but quantitatively over a period of years the width of the spring wood was almost constant, irrespective of rainfall. The amount of summer wood formed was almost directly in proportion to rainfall, especially that in the latter part of the growing season.

Vigorous trees, because of the fact that the sinuosities of their growth curves were well marked, were better indicators of the effect of climatic factors than were nonvigorous trees. The narrow rings of dry years were found the most reliable indexes for cross identification of rings in different trees. Data from one radius on 57 trees were about as reliable as the data obtained from four radii on the same trees. No marked relationship between cardinal directions and diameter growth at breast height was found, nor was any relationship established between unsymmetrical crown development and eccentric diameter growth. No apparent correlation was noted between crown size and the rate of diameter growth.

Effect of cattle grazing on vegetation of a virgin forest in northwestern Pennsylvania, H. J. Lutz (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 7, pp. 561–570, figs. 3*).—Studies by the Pennsylvania Experiment Station in a virgin forest stand consisting mostly of hemlock, beech, white pine, and red maple, and part grazed and part ungrazed showed some direct injury from grazing in the form of browsing, breakage, root injury, and actual pulling up of small trees. Browsing was governed by palatability, the deciduous trees suffering more than the conifers. As concerned reproduction, there was a large increase of hemlock, red maple, and beech trees less than 1 ft. tall on the grazed area, but trees from 1 to 25 ft. tall were much less numerous. The total number of shrubby and herbaceous species was much greater on the grazed than ungrazed area, some species appearing exclusively in the one or other sections. The surface soil of the grazed area was compacted, and the decomposition of organic matter on the forest floor was hastened. Rather rapid nitrification was indicated by the fairly common occurrence of species which are generally regarded as nitrophilous.

Effect of Ceanothus brush on western yellow pine plantations in the northern Rocky Mountains, W. G. Wahlenberg (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 8, pp. 601–612, figs. 8*).—Observing that Ceanothus and other shrubs springing up on burned-over forest areas seriously interfere with systematic planting operations, a study was made of the effect of Ceanothus on the development of young western yellow pines. Trees were planted in different positions in respect to the brush, (1) where they received much shade and root competition, (2) where there was little shade or competition, and (3) intermediate. Records taken during the critical midsummer season showed relative humidity to be higher, evaporation less, soil moisture higher, and soil temperature less under Ceanothus than in the open. As a result, the survival of pines was much higher under the brush. The suggestion is made that Ceanothus, although a nonlegume, possesses root nodules and may add to the nitrogen supply of the soil. The final effects of Ceanothus on pine seedlings is not yet established, but the author believes that the forest trees can successfully emerge to form a permanent stand.

Timber growing and logging and turpentining practices in the southern pine region, R. D. Forbes: (*U. S. Dept. Agr., Tech. Bul. 204 (1930), pp. 115, pls. 10, figs. 7*).—Based on the results of investigation and on the experiences of landowners, there are set forth in this bulletin the best silvicultural practices, designed first to keep timber lands from becoming barren and second for making full use of the productive capacity of the soil. The exclusion of fires, which are said to be very frequent and widespread in the southern pineries, is deemed of major importance but should go hand in hand with a silvicultural practice which leaves adequate seed trees. Hog grazing is conceded highly detrimental to longleaf pine reproduction, while moderate grazing of pine lands by cattle may be often beneficial.

In the second group of measures proposed as a means of developing the full capacity of the forest soil, fire protection, with adequate slash disposal, is again an important factor, and the maintenance of fully stocked stands, the practice of selective logging, improved turpentining operations, planting, and control of insects and diseases are also discussed.

The bulletin is preceded by an introduction by R. Y. Stuart.

Utilization of black locust, J. B. Cuno (*U. S. Dept. Agr. Circ. 131 (1930) pp. 20, pls. 5, figs. 7*).—Stating that the wood of the black locust is used chiefly for the manufacture of insulator pins, wagon hubs, treenails, fence posts, and mine timbers, the author presents a general discussion upon the growing of the tree, annual cut and supply, properties of the wood, and the manner in which it is prepared and used in the various enterprises above cited.

DISEASES OF PLANTS

[Plant pathology at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 258 (1930), pp. 23, 24*).—Studies by H. W. Thurston, jr., of various dusting and spraying materials for the control of apple scab showed the best results from the standard liquid lime-sulfur spray.

Fire-blight studies by E. L. Nixon included the testing of the resistance of various pear varieties. Some progress was recorded in the selection of potato seedlings possessing inherent resistance to virus degenerative diseases.

The tobacco wildfire disease (*Bacterium tabacum*) was found by W. S. Beach, in cooperation with the U. S. Department of Agriculture, to overwinter readily in tobacco refuse, soil, or on seed bed frames. The selection of new, clean sites for the seed bed proved an effective means of combating this disease. Weekly applications to the seed bed of 1–1–50 Bordeaux mixture at the rate of 1 qt. per square yard prevented disease development in purposely contaminated beds. Calomel at the rate of 1 gm. per square yard was also effective. Glass proved superior to cloth as a seed bed cover. Plants under muslin canopies developed free of the disease.

Report of the Dominion botanist for the year 1927, H. T. Güssow et al. (*Canada Expt. Farms, Div. Bot. Rpt. 1927, pp. 247, pls. 9, figs. 61*).—The introduction to this report, which is consecutive with that noted previously (E. S. R., 59, p. 48), outlines very briefly the general activities of the division of botany as far back as the 1910 report, gives the subject-matter headings proposed for the future, and states that it is intended hereafter to have these general sections reprinted separately. These section headings, five in number, are as follows: (1) General and economic botany, diseases of ornamentals, systematic mycology, surveys, and miscellanea; (2) forest pathology and related subjects; (3) investigations of the diseases of cereals and grasses; (4) investigations of the diseases of fruits and vegetables; and (5) investigations of the diseases of potatoes and field crops; potato certification service.

Phytopathological survey of Santo Domingo, 1925–1929, R. CIFERRI (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 1, pp. 44, pls. 2, figs. 2*).—The account here outlined is limited to a listing of the more important, economically speaking, of the plant diseases discovered to date in the Dominican Republic, with remarks on the more injurious.

Annual report of the mycologist for 1928, J. McDONALD (*Kenya Colony Dept. Agr. Ann. Rpt. 1928, pp. 187–197, pl. 1*).—To brief accounts of other activities in connection with plant diseases are added details of investigational work on diseases of wheat, sisal, coffee, barley, and sugarcane.

The proper taxonomic classification of certain pythiacious organisms, C. P. SIDERIS (*Science, 71 (1930), No. 1838, pp. 323, 324*).—The basis and laws of differentiation are set forth for Nematosporangium, Pythium, and Phytophthora.

Bacterial cataphoresis (*Pennsylvania Sta. Bul. 258 (1930), pp. 8, 9, 28*).—Studies by M. W. Lisse upon the effects of adding electrolytes to the medium used in growing bacteria showed no change in the charge of the organism grown therein, nor did additions of the chlorides of sodium, calcium, and aluminum or the sulfate and phosphate of sodium over concentrations usually from 10^{-4} to 10^{-2} M.

Studies on the effect of ultra-violet irradiation on the electrokinetic potential showed changes in pH accompanying the changes in potential. The changes in pH were not nearly so marked when the water used as the suspension medium was recently boiled distilled water.

Assisted by W. P. Davey, R. P. Tittsler and K. P. Dozois studied the effect of different intensities of X-ray exposure on the electrophoretic charge of washed suspensions of *Escherichia coli* and observed no results. Direct counts failed to show any effect on viability. Preliminary studies of the effect of heating on the electrophoretic charge did show some change.

Report on bunt prevention trials, 1928, R. W. MARSH (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1928, pp. 138, 139*).—Tabular reports of these seed treatment tests for control of bunt show, as against a 23.65 to 27.01 per cent infection of the untreated controls, a 0 to 0.15 per cent infection in the treated lots. There was no outstanding advantage in favor of any one of the seed treatments.

Seed treatment for controlling covered smut of barley, R. W. LEUKEL (*U. S. Dept. Agr., Tech. Bul. 207 (1930), pp. 23, fig. 1*).—Covered smut (*Ustilago hordei*) in Tennessee Winter barley was satisfactorily controlled by immersing the seed for one hour in any of the following solutions: Formaldehyde 1:320, Semesan 0.5 per cent, Uspulun 0.5 per cent, Germisan 0.25 per cent, Tillantin 0.25 per cent, Corona 620 0.25 per cent, and Bayer Compound 0.5 per cent. Under average soil-moisture conditions covered smut of barley is deemed controllable by the more effective dusts, and in these experiments the dust fungicides, Höchst, Abavit B, and Ceresan, gave satisfactory control of covered smut of barley without injury to the seed.

The effectiveness of the dust fungicides was apparently independent of soil reaction and, as far as could be determined, of the usual range of soil temperature. However, a soil-moisture content of less than 25 per cent of saturation decreased the efficiency of most of the dusts tested. The many advantages of dust fungicides over liquid fungicides for disinfecting seed grain are said to make it highly desirable to find effective and satisfactory dusts to replace liquids, especially the formaldehyde and copper sulfate treatments, which often cause marked seed injury with consequent reduction in stand and yield.

Synthetic nutrient solutions for culturing Ustilago zeae, E. R. RANKER (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 6, pp. 435–443, fig. 1*).—Recognizing the need of a standard duplicable culture medium for *U. zeae*, especially in view of the various physiologic forms, 26 nutrient solutions were tested for growth-producing possibilities in comparison with carrot decoction as a control. The results were in favor of a synthetic nutrient solution composed of 0.3 gm. of K_2SO_4, 0.1 gm. of NH_4NO_3, 0.1 gm. of $CaCl_2$, 0.1 gm. of $Mg_3(PO_4)_2.4H_2O$, 10 gm. of dextrose, and sufficient distilled water to make 1 liter, with 1.5 per cent of agar added if a solid medium is desired. The reaction of this nutrient solution before sterilization was pH 7.4 and after sterilization pH 5.6. The author suggests that maltose may be substituted for dextrose for certain physiologic forms of smut.

Influence of hulling the caryopsis on covered-smut infection and related phenomena in oats, T. R. STANTON, F. A. COFFMAN, V. F. TAPKE, G. A. WIEBE, R. W. SMITH, and B. B. BAYLES (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 8, pp. 621–633*).—During the course of breeding economic strains of oats resistant to *Ustilago levis*, the authors observed that the proportion of smutted plants was greatly increased by hulling, and, since a small percentage of seed is inadvertently hulled in threshing, the desirability of breeding oats resistant in the hulled stage was evident. Removing the hull from the oat before inoculation increased the percentage of smutted plants in susceptible varieties from 35.2 to 63.8 per cent, and in hybrids of these varieties with the smut-immune Markton oat from 3.8 to 12.8 per cent.

Of 112 lines showing no infection in 1925, 44 were infected in a second test when all seed was hulled. Of these 44 lines, 12 were grown from hulled and 32 from unhulled seed in 1925. In 3 varieties hulling reduced by 8.8 per cent the number of seedlings emerging from both inoculated and uninoculated seed, with indication that the effect of hulling on viability varies with varieties. The average percentage of plants reaching maturity in all tests was 54.7 for hulled and 61.8 for unhulled seed.

Rye varieties and selection against nematode attack [trans. title], J. D. KOBSLAG (*Tijdschr. Plantenziekten, 33* (*1927*), *No. 6, pp. 173–176; Ger. abs., p. 176*).—Trials beginning in the spring of 1926 and dealing with a number of rye varieties have revealed or developed certain degrees of varietal resistance to attack by *Tylenchus devastatrix*.

Experiments on the control of finger and toe in cabbages by the use of mercuric chloride and other substances, N. C. PRESTON (*Welsh Jour. Agr., 4* (*1928*), *pp. 280–295, fig. 1*).—Experimentation is described of testing chemicals during three years for control of brassicaceous finger and toe. Mercuric chloride at 0.1 per cent, the most satisfactory treatment, gave a considerable degree of control. A slight growth check appearing in some instances usually proved to be temporary. Inferior but still very good results were obtained with 0.5 per cent of Uspulum. Certain coal-tar dyes at concentrations up to 0.02 per cent proved ineffective. Treatment of the soil some weeks before planting with Carbokrimp, a tar-oil product, gave no conclusive results.

The nature of smut resistance in certain selfed lines of corn as indicated by filtration studies, E. R. RANKER (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 8, pp. 613–619, figs. 3*).—Seeking to establish the rôle of the juices of the various parts of certain smut-resistant strains of corn in resistance, filtrates were made of the juices of the whole plant, exclusive of the roots, and of different parts and after sterilization were inoculated with a smut culture (*Ustilago zeae*), and after a certain period at room temperature the growth of the smut organism was measured. In the case of the juices of the entire

plant, none of the filtrates, whether taken from a resistant or a susceptible strain, showed any appreciable inhibiting effect on the growth of the smut. However, where portions of the plant were used, there were striking differences in the growth of the organism, especially in the filtrates from smut-resistant strains, but no resistance occurred in the susceptible lines. Filtrates inhibiting smut growth gave the same results regardless of the source of the smut fungus. In some lines the inhibiting substance was most evident in the husk juice and in others in the leaf juice.

Corn diseases in Illinois, B. KOEHLER and J. R. HOLBERT (*Illinois Sta. Bul. 354 (1930), pp. 164, pls. 5, figs. 71*).—This is a comprehensive monograph on the diseases of the corn plant (*Zea mays*) in Illinois, prepared in cooperation with the U. S. D. A. Bureau of Plant Industry, and is divided into the following headings: Nature of plant diseases, distribution of corn diseases in Illinois, methods of disease control, causes of dead seed, seedling diseases, general diseases of the aerial parts, root rots, stalk rots, leaf diseases and defects, ear rots and other ear defects, and fungi and disease symptoms on the germinator.

Segregation (?) in Phoma terrestris, H. N. HANSEN (*Science, 71 (1930), No. 1842, p. 424*).—It is stated that while studying pink root disease of *Allium cepa* in material from Arkansas, California, Colorado, Louisiana, Massachusetts, New York, Oregon, and Texas, the author found the causal organism *P. terrestris* to differ so obviously in such characters as abundance, shape and size of pycnidia, number and length of ostioles, color of mycelium and substratum, and rate of growth as to justify the classification of the organism into three new species and several varieties were it not for the fact that all these organisms caused the same specific disease.

Intimate study of the California organism showed that if constant spore-mass transfers were made through several generations pycnidia were produced earlier and more abundantly than by mycelial transfers. This phenomenon, observed also in other genera of the imperfect fungi, indicated that the genetic constitutions of spores and hyphae are dissimilar and that single-spore cultures might therefore be expected to differ in some degree from the parent culture. This proved to be the case. Though several morphological characters showed variations during this investigation, only the mass color is here considered.

Of 50 single-spore cultures from the California organism, 42 were pink (like the parent) and the remaining 8 almost black. Several generations from single spores proved this dark variant to be homogenic for color. Subsequent generations of the pink form gave both pink and black in proportions varying from 10 to 36 per cent black with an occasional pink progeny, showing that in so far as color character of culture is concerned there are homogenic individuals of both the dominants and the recessives. Combining pure dark with pure pink by mixing either spores or mycelium gives a uniform pink culture. Single-spore cultures from such a union give cultures of pink, dark, yellow, and purple, apparently with no definite genetic ratios.

Inoculation experiments on onion seedlings with variants from single spores also show considerable variation as to pathogenicity, this fact suggesting that use of the single-spore method to obtain pure cultures may confuse both mycologists and phytopathologists.

The fact that *P. terrestris* gives variants from single-spore cultures indicates segregation of character factors, and the fact that it remains constant when perpetuated by mycelial transfers indicates segregation during pycnidium formation or spore maturation. Tentative experiments with *Fusarium martii phaseolus* indicate that members of Fusarium may behave similarly.

Potato diseases [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 6, 5. ed., rev. (1928), pp. 24, pls. 7, fig. 1*).—A review is given of several frequently occurring diseases of potato considered as controllable through field tests and selection.

Diseases of potato tubers [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 9, 4. ed., rev. (1929), pp. 20, pls. 4*).—This review of potato tuber diseases includes injuries due to attacks by nematodes.

Apical leafroll of potato, E. S. Schultz and R. Bonde (*Phytopathology, 19 (1929), No. 1, pp. 82, 83; also in Maine Sta. Bul. 353 (1929), pp. 144, 145*).—Apical leaf roll, a new potato disease of the virus type, was found to differ from primary leaf roll by persisting only on the upper leaves in succeeding generations. The disease was found to be carried through the tubers and transmissible to healthy plants by tuber grafts. Green Mountain, Rose No. 4, Irish Cobbler, and Bliss Triumph were susceptible varieties.

Physiological strains of Alternaria solani, R. Bonde (*Phytopathology, 19 (1929), No. 6, pp. 533–548, figs. 2; abs. in Maine Sta. Bul. 353 (1929), p. 148*).—Distinct strains of *A. solani* were observed in agar cultures. The strains differed in the abundance of spore formation but not in spore dimensions. Inoculation tests showed wide differences in pathogenicity. A minority of the strains failed to form a red pigment in potato agar and even prevented pigmentation by the more typical chromogenic strains, through increasing the alkalinity of the agar. Pigmentation varied with the strain, the kind of agar, the temperature, the initial H-ion concentration, and the amount of light, but not with the water content of the agar.

Recent potato virus-disease information contributing to the production of better seed potatoes, E. S. Schultz and D. Folsom (*Potato Assoc. Amer. Proc., 15 (1928), pp. 203–227; abs. in Maine Sta. Bul. 353 (1929), p. 147*).—Concerning the relation of virus diseases to potato production, evidence was secured that mild forms of mosaic do not alone develop into more severe types. No insects, except aphids, were found to transmit virus diseases. If seed pieces were dried before planting, knife transmission was not a factor. Rose, buckthorn, aster, and raspberry were not found to harbor potato viruses over winter. Isolation, tuber-unit planting, and roguing were found effective in keeping disease low. Nicotine dust was more effective than nicotine spray in controlling aphids. Growing samples of seed stocks in the greenhouse or in warmer regions was the only reliable means of testing stored stocks. No potato variety was found resistant to all viruses, but Irish Cobbler and Rose No. 4 were immune to mild mosaic and highly susceptible to rugose mosaic, leaf roll, and spindle tuber.

Is roguing effective in a tuber-unit seed plot in Aroostook? R. Bonde (*Amer. Potato Jour., 6 (1929), No. 7, pp. 206–208; abs. in Maine Sta. Bul. 353 (1929), p. 149*).—The value of consistent roguing of potato stocks was shown in 91, 20, and 4 per cent of disease, respectively, in three lots of the same original stock, (1) not rogued for 2 years, (2) not rogued for 1 year, and (3) rogued regularly.

Seed potato treatments for Rhizoctonia conducted in northeastern Maine from 1925 to 1928, E. S. Schultz, L. O. Gratz, and R. Bonde (*Potato Assoc. Amer. Proc., 15 (1928), pp. 102–112; abs. in Maine Sta. Bul. 353 (1929), pp. 145, 146*).—Of various treatments tested for the control of Rhizoctonia, cold corrosive sublimate was found the most effective, and even this treatment under certain conditions sometimes reduced the yield by injuring the seed. In general, Rhizoctonia was not a serious factor, but seed treatment was beneficial because of the decrease in the rotting of the seed piece.

Experimental spraying and dusting in Aroostook County, R. Bonde (*Potato Assoc. Amer. Proc., 15 (1928), pp. 170–179; abs. in Maine Sta. Bul. 353 (1929), p. 146*).—In carefully planned experiments, in which several fungicides were compared on potatoes during a season of severe late blight, no material proved superior in respect to yields, and all gave good control of the disease. Colloidal-copper spray was satisfactory when used at half the metallic-copper strength of standard Bordeaux mixture and apparently caused less foliage injury than either Bordeaux mixture or copper-lime dust. The standard Bordeaux mixture was less expensive than either copper-lime dust, dry Bordeaux spray, or dry Bordeaux dust.

A nematode disease of potato [trans. title], H. M. Quanjer (*Tijdschr. Plantenziekten, 33 (1927), No. 6, pp. 137–172, pls. 5, fig. 1; Ger. abs., pp. 163–167*).—An account is given of an attack of potato by *Tylenchus dipsaci* during 1921 and later in the Netherlands province of Limburg.

A leaf-spot disease of safflower (Carthamus tinctorius) caused by Cercospora carthami nov. sp., S. Sundararaman and T. S. Ramakrishnan (*Agr. Jour. India, 23 (1928), No. 5, pp. 383–389, pls. 5*).—Safflower (*Carthamus tinctorius*), cultivated widely in many parts of India, especially in Bengal, Central Provinces, United Provinces, and Bombay, restricted in the South to parts of Mysore and the Ceded Districts, and rarely raised as a crop by itself in the Madras Presidency, has not yet been recorded as suffering from many diseases. A leaf spot disease caused by *Cercospora* sp. was observed at Coimbatore in 1921, 1922, 1924, and 1925. Humidity favors both prevalence and spread. The disease, which appears at various stages of growth of the plant, is described. Infections on other hosts listed were negative. Spraying was clearly beneficial. The organism, which was studied and found to attack leaves, bracts, and stem of *Carthamus tinctorius* in Coimbatore, is technically described as the new species *Cercospora carthami*.

A further note on the mosaic disease of sugarcane, W. McRae and L. S. Subramaniam (*Agr. Jour. India, 23 (1928), No. 4, pp. 239–255, pls. 3, fig. 1*).—"The mottling of mosaic disease on the leaves in the thin canes of northern India, described in a previous note [E. S. R., 58, p. 243], is fairly well illustrated in . . . the present article." The incidence of sugarcane mosaic in India is shown by a locality list and map, and both areas and percentages of mosaic stools are indicated. Varietal incidence of mosaic in Burma is tabulated. An account is given of the spread of mosaic by natural means and of its occurrence on maize, also regarding germination of sets, infection experiments, and time of the appearance of mosaic mottlings. The efficacy of roguing in India is made evident.

"Finger and toe" experiments in mid-Wales involving the use of resistant varieties of swedes, D. W. Davies, M. Griffith, and G. Evans (*Welsh Jour. Agr., 4 (1928), pp. 295–303*).—These tests are said to show the superior resistance of Danish swedes to finger and toe (*Plasmodiophora brassicae*). None is immune, but in some strains the infection appears very slight in comparison with that in British varieties used. Danish varieties can give a higher yield on land carrying much of the finger-and-toe organism. This agrees with the experience of the farmers. Of the several strains of Danish Bangholm swedes, only a few are reputed to be resistant. Among these are the Hernig and Studsgaard strains. Wilhelmsburger is also resistant. Liming is advised.

[Work with tobacco diseases by the Kentucky Station] (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 16–18*).—Greenhouse studies upon the frenching disease of tobacco indicated that liming of certain soils induced this condition. With the

pH of the culture medium ranging between 5 and 6, frenching did not appear in Turkish tobacco grown in sand or in water cultures, even when either nitrogen, phosphorus, magnesium, or iron was lacking. The simple precaution of washing the hands and the abandonment of natural leaf in favor of sterilized chewing tobacco by the workers practically eliminated mosaic infection at the time of transplanting.

The nature and symptoms of several virus diseases of the potato and tobacco are again discussed (E. S. R., 62, p. 233).

Attempts to control bacterial leaf spot diseases of tobacco by careful sanitation measures in the growing of the plants were offset by heavy rains which flooded the plant beds. It is believed that the diseases are harbored in native vegetation, and, in fact, isolations from spots on elder (*Sambucus* sp.) leaves produced typical angular leaf spots on tobacco.

Finding black root rot prevalent in tobacco plants grown in Daviess County soils used for the same purpose for several years, trials were made of various resistant strains. These grew better in the plant bed than ordinary stock, but in the field the susceptible strains practically equaled the resistant in growth, indicating that the acid soils of Daviess County are not badly contaminated. The indications were that disease-resistant strains of both dark and Burley tobaccos may be developed.

Studies on the progeny of single-cell isolations from the hairy-root and crown-gall organisms, W. H. Wright, A. A. Hendrickson, and A. J. Riker (*Jour. Agr. Research [U. S.], 41 (1930), No. 7, pp. 541–547, fig. 1*).—Comparisons of the poured-plate and single-cell isolation methods for growing cultures of crown gall (*Phytomonas tumefaciens*) and hairy root (*P. rhizogenes*) were decidedly in favor of the single-cell method. Using a peptone-salt medium and cells taken from a mother culture in the proper growth stage, "logarithmic growth phase," usually a high percentage of single cells of both organisms were made to grow.

The cultures from single-cell isolations were remarkably consistent in their behavior, those from either organism giving typical reactions for the parental organism. Single-cell isolations from a culture which showed a mixture of the characters of the two diseases and which was formerly considered as a possible intermediate organism yielded progeny consistently like their parent and not intermediate.

Studies on infectious hairy root of nursery apple trees, A. J. Riker, W. M. Banfield, W. H. Wright, G. W. Keitt, and H. E. Sagen (*Jour. Agr. Research [U. S.], 41 (1930), No. 7, pp. 507–540, figs. 5*).—An infectious type of hairy root (*Phytomonas rhizogenes* n. sp.) is described as to symptoms on various hosts and as to growth on culture media. Isolations from 96 enlargements of the hairy-root type showed 4 to contain the crown-gall organism, 1 an apparent mixture of the crown-gall and hairy-root organisms, 78 the hairy-root organism, and 13 no pathogenes. Typical hairy-root cultures were isolated from 40 of the hairy-root specimens. The hairy-root organism was inoculated into the stems of the apple, rose, honeysuckle, sugar beet, bean, and Paris daisy, but little or no response was obtained in tomato and tobacco stems.

Studies at the Wisconsin Experiment Station showed that the reactions of the underground parts of Wealthy apple stems to crown-gall and hairy-root inoculations and to needle punctures were very similar at the end of 2 weeks, but after a month the enlargements showed a decided increase in size and a change in surface character to the crown-gall type, and after 2 months the symptoms of hairy root were evident. At this stage the controls had healed.

The roots stimulated by the hairy-root organism were found capable of supporting the life of the apple, Delphinium, and Paris daisy, but it is not known whether the effects of the hairy-root organism on the several plants over a long period are harmful or beneficial.

Difficulty in separating the crown-gall and hairy-root cultures is thought to have led to considerable confusion in differentiating between the two. Confirmatory results were obtained where cultures were grown from single-cell isolations.

Spraying trials against apple scab at Long Ashton in 1928, J. G. MAYNARD and R. W. MARSH (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1928, pp. 112–123, pl. 1*).—An account is given of detailed observations on scab control, spray damage, and costs of spraying as made at Long Ashton during 1928 on plats of much used apple varieties.

On plats receiving two preblossom sprays of excess-lime Bordeaux mixture followed by postblossom application of weak Bordeaux mixture or of double-strength colloidal sulfur, the yield of clean fruit ranged from 94 to 100 per cent. An inadequate control (one row of one variety) showed only 60 per cent clean fruit.

Data are presented as to Bordeaux injury and to serious damage from colloidal sulfur in case of the varieties Stirling Castle and Lane Prince Albert. The relation of this damage to weather is discussed. A detailed exposition of costs is held to show that labor charges account for a relatively large proportion of the total.

The economics of spraying fruit trees.—I. The cost of winter washing—winter 1928–29, J. G. MAYNARD (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1928, pp. 124–137, pls. 2, figs. 2*).—An account is given of winter washing, tabulations of costs, and similar details.

A preliminary note on the control of black currant leaf spot (Pseudopeziza ribis), R. W. MARSH and J. G. MAYNARD (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1928, pp. 109–111, pls. 2*).—Outbreaks of black currant leaf spot due to *P. ribis*, first indicated as serious by Briton-Jones in 1925 (E. S. R., 57, p. 849), are said to have become general in all currant-growing regions.

The authors set forth the favorable results obtained in trials made at Long Ashton in 1928, using on half plats on July 20, Bordeaux mixture at 4–4–50 and 2–4–50 strengths. A part of the weaker mixture was sprayed only from the underside of the leaves, in so far as was practicable. A hand sprayer with two nozzles was used.

Within a month the efficiency of the treatment was apparent. The sprayed rows showed no defoliation, and the existing spots on the older leaves made no further progress. No variations due to the different methods or strengths could be determined. Tabulated results of measurements of buds made on November 8 showed that the buds from the sprayed plats were 15.8 per cent heavier than those from the unsprayed.

Experiments on the relation of strawberry eelworm (Aphelenchus fragariae) to "red plant" and "cauliflower" disease of strawberries.—Progress report, L. N. STANILAND and T. SWARBRICK (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1928, pp. 76–86*).—Reviewing briefly the previous findings by Ballard and Peren (E. S. R., 52, p. 748), by Lees and Staniland (E. S. R., 56, pp. 152, 850), by Staniland (E. S. R., 57, p. 850), and by Ball (E. S. R., 59, p. 246), the authors in the present article give an account of studies carried on during 1927–28. Although the plants used were not un-

questionably free from *A. fragariae*, it is stressed that Aphelenchus was present in a small part only of the growing points of the runners from red plant in June, July, August, November, or February.

The relative resistance of varieties and species of Citrus to Pythiacystis gummosis and other bark diseases, L. J. KLOTZ and H. S. FAWCETT (*Jour. Agr. Research [U. S.], 41 (1930), No. 5, pp. 415–425*).—As a result of inoculation tests on brown-rot gummosis made in the California Citrus Experiment Station variety orchards, the authors report that great variations exist in the degree of susceptibility of different varieties of a single species, in individuals of the same variety, and even in two or more areas on the same tree trunk, thus necessitating several inoculations on each tree to obtain a dependable average. Varieties of pomelo and citrange showed the largest differential response, ranging from a susceptibility exceeding that in the lemon varieties to a resistance greater than the average of the sour orange group.

Ranged in descending order of susceptibility were lemon, citrange, lime, pomelo and sweet orange, mandarin, rough lemon, tangelo, sour orange, and kumquat. Calamondin (*C. mitis*), *C. hystrix*, *C. limetta*, *C. ichangensis*, Sampson tangelo, and certain citranges are deemed of sufficient resistance to justify their trial as rootstocks. The amount of gum formed was approximately proportional to the severity and extent of the disease.

Preliminary tests of the degree of inhibition of fungal enzymes by substances in the bark gave some indication that such tests may have practical value as indicators of resistance.

Palm diseases in Malaya, A. SHARPLES (*Malayan Agr. Jour., 16 (1928), No. 9–10, pp. 313–360, pls. 19, fig. 1*).—This report is in two parts, dealing, respectively, with palm diseases somewhat generally and the associated fungi rather more particularly, with a bibliography of 16 titles.

Phytopthora root rot of calla [trans. title], C. J. BUISMAN (*Tijdschr. Plantenziekten, 33 (1927), No. 2, pp. 17–22, pl. 1, figs. 2; Eng. abs., p. 22*).—A nursery disease of calla is briefly described as having for several years caused occasional losses through serious changes occurring in the plants attacked, these including a check in growth, yellowing, and lowering of flower yield, associated with a corm rot, and a watery disintegration of the roots. From the diseased roots a Phytophthora, apparently new, was isolated, and is designated as *P. richardiae*. Artificial infection tests proved this organism to cause the disease. A method of control which is given consists in treating the corms for one hour with 1:49 formalin.

Carnation rust, P. E. TILFORD (*Ohio Sta. Bimo. Bul. 147 (1930), pp. 191–195, fig. 1*).—Following a discussion of the symptoms and cause of carnation rust, information is presented on the relative susceptibility of many varieties and on the value of spraying cuttings in the propagation bench with lime-sulfur or Bordeaux mixture. Both of the fungicides proved highly effective.

Chestnut blight, G. F. GRAVATT and L. S. GILL (*U. S. Dept. Agr., Farmers' Bul. 1641 (1930), pp. II+18, figs. 15*).—A general discussion of the chestnut blight situation and problem, considering spread, distribution, symptoms, the causal organism, deterioration of wood, utilization of blight-killed trees, and finally the possibilities of growing blight-resistant chestnuts. It supersedes Circular 370 (E. S. R., 55, p. 150).

Conditions favoring injury by Lophodermium pinastri in fir plantings [trans. title], E. HESSELINK (*Tijdschr. Plantenziekten, 33 (1927), No. 5, pp. 105–124, figs. 3*).—This is an account of injury to firs by *L. pinastri* in several localities as related to environmental conditions, of which weather factors are presented in detail. A review of literature and a bibliography are supplied.

Relation between moisture content of the wood and blue stain in loblolly pine, R. H. COLLEY and C. T. RUMBOLD (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 5, pp. 389–399, pls. 2, figs. 3*).—Seeking to determine the moisture content of the sapwood of loblolly pine (*Pinus taeda*) below which blue stain will not occur, laboratory studies were conducted at the Forest Products Laboratory, Madison, Wis., and gave evidence that no staining of sapwood occurs at 24 per cent or less, oven-dry basis. It is pointed out, however, that in the experiment the wood was submitted to a temperature of 100° C. for 30 minutes in order to prevent mold contaminations. At a moisture content of 24 per cent, oven-dry basis, which is equivalent to 19.3 per cent on the wet-wood basis, approximately 53.5 per cent of the volume of the wood was air, 35 per cent was wood substance, and 12.5 per cent was water.

The moisture content of the outer wood is conceded to play a part in blue-stain development, since if containing more than 24 per cent of moisture, although the sapwood is below this point, blue-stain infection may start. However, unless the rainy weather was prolonged, the outer tissues would soon dry to below 24 per cent, and the further growth of the blue-stain organisms would be inhibited.

The nemic fauna of the slime flux of the Carolina poplar, G. STEINER (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 6, pp. 427–434, figs. 3*).—Descriptions are presented of two nematodes (*Diplogasteroides stigmatus* n. sp. and *Diplogaster americanus* n. sp.) discovered in the slime flux taken from Carolina poplar trees growing at Shepherdstown, W. Va.

Predacious nemas of the genus Nygolaimus and a new genus, Sectonema, G. THORNE (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 6, pp. 445–466, figs. 18*).—Technical descriptions are presented for several predacious nemas belonging to two genera found in sugar beet fields of the Western States also infested with the common sugar beet nematode (*Heterodera schachtii*). Many nygolaims were found living in close proximity to the females of *H. schachtii*, but no traces of the latter were found in the intestines, although setae and cuticle of oligochaete worms were present. In the laboratory, nygolaims and sectonemas refused to devour other nemas but did feed on oligochaetes, leading to the inference that the nygolaims are not of economic importance in the control of plant-infesting nemas.

In no case was the same species of Nygolaimus found inhabiting both cultivated and virgin soil. These nemas inhabited both fresh water and soil, but were apparently much more numerous in soil, especially sandy types. In general appearance the nygolaims closely resemble nemas of the genus Dorylaimus, but the author establishes definite differences in structure.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Outlines for studies of mammalian life histories, W. P. TAYLOR (*U. S. Dept. Agr., Misc. Pub. 86* (*1930*), *pp. 12*).—This is a revision of Circular 59 (E. S. R., 42, p. 354), with some modification and expansion of the method of treatment.

Directory of officials and organizations concerned with the protection of birds and game, 1930, compiled by T. DENMEAD and F. G. GRIMES (*U. S. Dept. Agr., Misc. Pub. 92* (*1930*), *pp. 13*).—This is in continuation of previous editions (E. S. R., 62, p. 52).

Symposium on predatory animal control (*Jour. Mammal., 11* (*1930*), *No. 3, pp. 325–389, figs. 2*).—The contributions to this symposium, held at the twelfth annual meeting of the American Society of Mammalogists in New York in May, 1930, are as follows: The Coyote—Archpredator, by E. A. Goldman (pp. 325–

334); The Control of the Coyote, by W. C. Henderson (pp. 336–350); Rational Predatory Animal Control, by C. C. Adams (pp. 353–358); Predatory Mammal Destruction, by E. R. Hall (pp. 362–369); Fur-Bearers Caught in Traps Set for Predatory Animals, by J. S. Dixon (pp. 373–376); and At the Cross-Roads, by A. B. Howell (pp. 377–389).

The prairie pocket gopher, Thomomys talpoides rufescens, S. CRIDDLE (*Jour. Mammal., 11 (1930), No. 3, pp. 265–280, pl. 1, figs. 3*).—This is a report of a study made of the habits of the prairie pocket gopher in the vicinity of Aweme, Manitoba, Canada.

Siberian sable (Martes zibellina L.) and his relations, G. VAN DER BELLEN (*Amer. Game Protect. Assoc. Bul., 18 (1929), No. 6, pp. 94, 95, 96, figs. 3*).—It is pointed out that the American marten is the nearest relative of the Siberian sable, and that the fisher and the Hirsa marten are farthest removed from the sable. However, the sable, American marten, stone marten, and Baum marten are so closely related to the sable that only small differences in their appearance separate one from the other. The following forms of the genus Martes are mentioned: Baum marten (*M. martes* L.), stone marten (*M. foina* Erxl.), Siberian sable (*M. zibellina* L.), American marten (*M. americana* Turt.), fisher (*M. pennanti* Erxl.), and Hirsa marten (*M. flavigula* Radd.).

The rat: A world menace, A. M. HOGARTH (*London: John Bale, Sons & Danielsson, 1929, pp. [VIII]+112, pls. 2, figs. 5*).—This handbook on the rat deals with its biology, economic importance, disease transmission, natural enemies, and means of control.

Introduction to human parasitology, A. C. CHANDLER (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 4. ed., rewritten and enl., pp. XIV+655, figs. 308*).—This is a rewritten and enlarged work which supersedes Animal Parasites and Human Diseases, previously noted (E. S. R., 54, p. 855).

The rise of applied entomology in the United States, L. O. HOWARD (*Agr. Hist., 3 (1929), No. 3, pp. 131–139*).—A review of the development of economic entomology in the United States, presented before the twelfth annual meeting of the Agricultural History Society held in Washington, D. C., in April, 1929.

The Bureau of Entomology: Its history, activities, and organization, G. A. WEBER (*Inst. Govt. Research, Serv. Monog. U. S. Govt. No. 60 (1930), pp. XII+177*).—The first part of this service monograph deals with the history (pp. 1–52), the second part with activities (pp. 53–99), and the third part with organization (pp. 100–114). The several appendixes consist of an outline of organization, the classification of activities, publications, laws, financial statement, and a bibliography. An index is included.

[Notes on economic insects and control measures] (*Jour. Econ. Ent., 23 (1930), No. 3, pp. 640–646*).—The contributions presented are as follows: A New Host Record for the White Pine Weevil, by R. L. Taylor (p. 640); An Unrecorded Food-Habit of the Large Tobacco Suck-Fly in Porto Rico, by M. D. Leonard (pp. 640, 641); Further Notes on the Hawthorn Carposina Which Attacks Apples in Missouri, by L. Haseman (p. 641) (E. S. R., 63, p. 462); Terpineol, a Solvent for Removing a Commercial Tree-Banding Material from Insects, by F. L. Campbell (p. 641); *Dicyphus minimus* Uhler, a Pest on Tomatoes (Hemiptera, Miridae), by H. G. Johnson (p. 642); Relative Covering Power of a Miscible Oil and Lubricating Oil Emulsions, by O. I. Snapp and J. R. Thomson (pp. 642, 643); Peruvian Potato Pests, by G. N. Wolcott (pp. 643, 644); Injury to Celery in the Sanford, Florida, District by the Larvae of the Noctuid Moth *Perigea sutor* Guen., by D. Stoner and C. B. Wisecup (pp. 644, 645); and Longevity of the Mexican Bean Beetle in the Southwest, by J. R. Douglass (pp. 645, 646).

[Work with economic insects at the Kentucky Station] (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 36, 37, 40*).—In addition to studies of the biology of the eggplant flea beetle and the potato flea beetle (E. S. R., 63, p. 655), studies of the potato leafhopper were continued during the year (E. S. R., 62, pp. 245, 355). The results of a comparison made of the yields of dry weights of infested plants with those of uninfested plants, including alfalfa and several grasses and clovers, are reported in percentages. The leafhopper was found to prefer the smooth-stemmed strains of clover to the relatively more hairy strains.

Effective control of nematodes in the greenhouse benches was obtained by firing the furnace on hot days in August, with doors and ventilators closed, a temperature of 160° F. being attained in the air and 140° in the soil in the benches. Previous to this heating, which was continued for several days, the greenhouse benches were thoroughly watered. White fly was controlled more effectively by a pyrethrum spray than by fumigation with nicotine or hydrocyanic gas. The application was made about noon on a sunny day, with a temperature of about 100° in the house.

[Economic insects and their control in New Jersey] (*N. J. State Hort. Soc. Proc., 1929, pp. 36–44, 50–56, 179–182, 182–188*).—The contributions on economic entomology presented at the annual meeting of the New Jersey State Horticultural Society, held at Asbury Park, N. J., in November, 1929, include the following: The Primary Insect Problems of the Fruit Grower in the Season of 1930, by T. J. Headlee; Present Status of Oriental Peach Moth Control in New Jersey, by B. F. Driggers; A Much Cheaper Treatment for Destroying Plant Lice, by T. J. Headlee; and Controlling the Pepper Maggot [*Spilographa electa* Say], by R. C. Burdette.

[Work with economic insects at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 258 (1930), pp. 36–39, fig. 1*).—It was found by H. N. Worthley that of the 35.7 per cent damage caused in 1929 to McIntosh apples on untreated plats, over one-half was due to miscellaneous chewing insects such as leaf rollers and green fruit worms. Where a midsummer spray was omitted to lessen danger of arsenical residue, spray gave 43.8 per cent control of these insects and dust 23 per cent control. On Stayman, dusted and sprayed plats alike showed 56.5 per cent control. Seventeen per cent of the fruit from untreated plats of Stayman was injured by the plum curculio, and 12.1 per cent by the codling moth. Under these conditions, both dusted and sprayed plats showed over 90 per cent control of the plum curculio, with no midsummer application. Spraying gave only 48 per cent control of codling moth, dusting 23.2 per cent control. Thus it appears unsafe to omit a midsummer application without increasing the number of the earlier treatments.

In work with the oriental fruit moth, S. W. Frost found some Elberta peaches with less than 5 per cent injury at picking time, while others showed 25 per cent or more. It is thought that the nature of the soil and thoroughness of cultivation may have some bearing on these differences. Twig infestation in the State begins about May 28 and continues until July 15 or later, the peak being reached in June. Fruit infestation starts about June 10 and continues until picking time, becoming more severe with each successive brood. While the bait pail method reduces the population of moths considerably, its failure to reduce the amount of wormy fruit some years indicates the necessity of further investigation.

In experimental work with seed repellents for wireworms C. A. Thomas found that very few chemicals have any value for this purpose.

In work with mushroom insects Thomas found the noctuid "looper" caterpillar which attacks the crops in the fall to be *Metalestra quadrisignata* Walk.

This caterpillar is not, however, an important pest of mushrooms, as it soon disappears from the houses. The hymenopterous parasite *Calliceras amplus* Ashm. attacks the mushroom sciarid flies, but is not sufficiently abundant to be an important control factor. Sulfur burned in mushroom houses when the manure was at its top heat killed many insects if the manure temperature was high enough (125 to 130° F.) to drive these pests to the surface. Sulfur, however, should not burn longer than a few hours and should never be used when mushrooms are in that or adjoining houses. Sulfur is more toxic to the mites than is cyanide or practically any other fumigant tested. Of the various insecticides tested against the mushroom flies during the season a new pyrethrum dust, 60 per cent active, was found to be cheaper than many of the present mushroom fly insecticides and more efficient than most of them.

Results secured in work with the European corn borer in 1929, reported by Worthley, support those obtained the preceding year. In laboratory tests in 1929 with 6,000 eggs and 1,000 larvae technical white oil at 1 per cent strength in a kaolin-oil emulsion and in two proprietary emulsions gave from 92 to 97 per cent control of eggs. At 0.5 per cent oil, with acid lead arsenate 4 lbs. to 100 gal., the reduction in larval establishment was over 96 per cent. Four applications at 1 per cent strength with 4:100 lead arsenate failed to injure Golden Bantam corn in the insectary garden. A pale paraffin oil gave slightly better control, but some injury to plants was suspected.

In work by Worthley with the codling moth a commercially prepared β-naphthol band was tested for its efficiency in trapping larvae and killing them, thus reducing the number of individuals producing the summer brood of worms. An examination on September 23, 1929, showed all larvae that had been in the bands for two weeks to be dead. Under the climatic conditions prevailing in 1929 this band maintained its killing efficiency through the period of summer pupation.

Observations on the pests of cultivated plants which appeared in the District of Lublin and in a part of the District of Kielce during the years 1926 and 1927 [trans. title], J. Woroniecka (*Pam. Pánst. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polon. Écon. Rurale Pulawy*, *9* (*1928*), *No. 1, pp. 210–251; Eng. abs., pp. 247–251*).—A summary of information on insect and other animal pests of cultivated plants in these districts of Poland.

Report of the entomological division, C. Smee (*Nyasaland Dept. Agr. Ann. Rpt. 1929, pp. 13–21*).—This is an extended report of the entomological work of the year 1929 (E. S. R., 61, p. 657) with insect enemies of tobacco, cotton, tea, coffee, maize and sorghums, miscellaneous crops, and forestry, and with grasshoppers.

Winter soil temperatures and their relation to subterranean insect survival, G. A. Mail (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 8, pp. 571–592, figs. 11*).—This is a contribution from the Minnesota Experiment Station on work conducted during the winter of 1927–28. It is pointed out that the data obtained are, however, of wide application, affecting every form of insect life that is passed in the soil in any stage. The details are presented in table and chart form. The thermocouple apparatus for taking soil temperatures is described and records of such temperatures during the winter months in Minnesota at depths of from 2 to 24 in. are analyzed.

It was found that "snow is normally an adequate protection from cold to insects which hibernate at depths below 4 in. Rain or a rise in temperature inducing a thaw destroys the temperature gradient in the first 2 ft., and if such conditions are followed by a decided drop in temperature hibernating insects may suffer high mortality. The differences in the conductivity of

soils of various types are not sufficiently great to be significant in insect hibernation. Larvae and adults of *Melanotus communis* have a sufficiently low freezing point to withstand Minnesota winter temperatures if they hibernate below 4 in. in the ground. Larvae and adults of two species of wireworms buried outside all winter at depths from 2 to 24 in. practically all survived—the small mortality not being due to temperature conditions. The possibility of larvae and adults of white grubs surviving similar conditions is discussed. It is concluded that winter climatic conditions may in certain instances cause heavy mortality among hibernating wireworms."

Supplement to chloropicrin bibliography (*U. S. Dept. Agr., Bur. Chem. and Soils, 1927, pp. 8; 1930, pp. [1]+19*).—These are mimeographed supplements to the bibliography previously noted (E. S. R., 55, p. 554). The first is by R. C. Roark and the second by W. A. Gersdorff.

Dermatitis due to insect powder, M. B. SULZBERGER and C. B. WEINBERG (*Jour. Amer. Med. Assoc., 95 (1930), No. 2, pp. 111, 112, fig. 1*).—A report is made of a case of eczematous dermatitis sufficiently severe to affect the general health that resulted from the frequent and periodical distribution of insect powder in the room in which the patient worked. Through the application of the patch test it was found that the patient's skin was extremely hypersensitive to the insect powder present in the workroom. Its elimination resulted in a speedy recovery.

***A contribution to the biology of the brown swarm locust* Locustana pardalina (Wlk.) and its natural enemies,** J. T. POTGIETER (*Union So. Africa Dept. Agr., Sci. Bul. 82 (1929), pp. 48, pls. 9*).—An account of the life history, habits, and natural enemies of *L. pardalina*, the details of which are given in tabular form.

The plant lice or Aphididae of Great Britain, F. V. THEOBALD (*London: Headley Bros., 1929, vol. 3, pp. VI+364, figs. 213*).—This third volume of the author's work (E. S. R., 58, p. 758) completes the description of the British aphids as far as at present known.

Repellent banding to control the ants attending the common coffee mealy-bug, H. C. JAMES (*Nairobi: Kenya Colony Dept. Agr., 1930, pp. II+14, figs. 3*).—Of the many repellents that have been tried, only three types have been found cheap enough and to have a sufficiently long period of effectiveness to be of value against ants attending *Pheidole punctulata* Mayr. in Kenya Colony, namely, high boiling point tar oils (Kresotow and similar substances); castor oil mixed with a poison; and adhesive preparations, such as Bandite, TCN6, and Tanglefoot.

[Notes on Lecanium corni L.], P. VOUKASSOVITCH (*Compt. Rend. Soc. Biol. [Paris], 104 (1930), No. 25, pp. 1065–1070*).—An account of observations on the polyphagy of this scale (pp. 1065–1068) is followed by an account of certain variations in the behavior of the scale when raised on the sedge *Cyperus papyrus* (pp. 1068–1070).

The control of codlin moth in Australia: Notes on the possible utilization of Trichogramma (Hym., Chalcidoidea), J. W. EVANS (*Jour. Council Sci. and Indus. Research [Aust.], 3 (1930), No. 2, pp. 106–116*).—This preliminary account includes reports of experiments with various hosts of Trichogramma, systematics and bionomics, and the technic of production, together with a general review of the problem.

The codlin moth (Carpocapsa pomonella L.) (*Cyprus Gaz. No. 2067 (1930), Agr. Sup. 24, pp. 1–3, figs. 3*).—An account of this pest as applied to conditions in Cyprus.

Parasites of the oriental peach moth, Laspeyresia molesta Busck, in North America, G. J. HAEUSSLER (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 5, pp. 365–377, figs. 3*).—This is a report of a study conducted at Riverton, N. J., of the parasites of the oriental fruit moth occurring in that district, including a description of some of the methods which have proved to be most satisfactory for conducting a survey of the parasites of this pest in any locality. Thus far, 57 species of primary parasites of this pest in North America have been recorded, the larval parasites *Macrocentrus ancylivora* and *Glypta rufiscutellaris* and the egg parasite *Trichogramma minutum* being of chief importance. Eight species of secondary parasites have also been found.

The records of parasites of larvae were obtained by making weekly collections throughout the season of peach twigs infested by the host larvae and rearing these larvae to maturity. "By trimming off the leaves and placing the portion of stems containing the larvae on apples in glass jars, 39.1 per cent more individuals were able to complete their development than when each larva was removed from the twig and placed on fruit.

"*T. minutum* was the only parasite found at Riverton which develops entirely within the egg of the host. *Ascogaster carpocapsae* and *Phanerotoma tibialis* oviposit in the egg of the host but complete their development within the larva. Fourteen species of parasites of larvae were found in larvae feeding in peach twigs at Riverton during the seasons of 1925 to 1928, inclusive. *M. ancylivora* is the only important parasite of larvae in the Riverton district. During the 4-year period, 91 per cent of all the parasites of larvae present were *M. ancylivora*, and parasitism by this species alone averaged 48.23 per cent.

"The seasonal parasitism by all species of parasites combined varied from 60.81 per cent in 1926 to 44.55 per cent in 1928, with an average of 52.89 per cent for the four seasons. Parasitism as high as 95 per cent occurred in weekly collections of larvae in 1925 and 1926. *M. ancylivora* emerges early enough in the spring to attack the first host larvae that feed in peach twigs. The most abundant parasitism occurred each season when host larvae were most abundant in twigs. Parasitism of larvae of the first and second broods caused a decided decrease in the number of twigs infected each season. Parasitism of 28 per cent by *M. ancylivora* and 7 per cent by *M. delicatus* occurred in larvae feeding in peach fruit in the early part of the season, but less than 2 per cent parasitism was found in wintering larvae collected while feeding in peaches in the fall. About 4 per cent of the larvae collected while feeding in quince fruit at harvest time were parasitized, and *P. tibialis* was the most abundant parasite. Parasitism by *G. rufiscutellaris* was much more abundant in these larvae than in larvae feeding in twigs. *Acnoplex betulaecola* was the most common parasite of the stages within the cocoon. High mortality, due to disease, occurred in oriental peach moth larvae hibernating in cocoons spun under quince bark."

Blue mould of tobacco: Progress report of studies on an insect vector, H. R. ANGELL, A. V. HILL, and G. A. CURRIE (*Jour. Council Sci. and Indus. Research* [*Aust.*], *3* (*1930*), *No. 2, pp. 83–86*).—"The moths of the tobacco splitworm *Phthorimaea operculella* Z. collected from diseased tobacco seedlings carry the conidia of the fungus causing blue mold of tobacco. Other moths of the same species that were allowed to come in contact with diseased material caused healthy seedlings on which they later alighted to develop characteristic symptoms of blue mold. An equal number of checks remained healthy. It is suggested that they, as well as other insects, may be responsible in some instances for transferring conidia from diseased plants to healthy seed beds in the vicinity."

Racial differentiation of "Anopheles maculipennis" in Netherlands and its relation to malaria, A. DE BUCK, E. SCHOUTE, and N. H. SWELLENGREBEL (*Riv. Malariol., 9 (1930), No. 2, pp. 97–110, figs. 2*).—To the morphological characters distinguishing the short-winged multidentate race of *A. maculipennis* prevalent in the malarious regions of the Netherlands from the long-winged paucidentate race in the nonmalarious areas are added two new ones bearing on the morphology of the larvae and the male hypopygium.

The survival of various microörganisms within the gastro-intestinal tract of Aedes aegypti, J. H. ST. JOHN, J. S. SIMMONS, and F. H. K. REYNOLDS (*Amer. Jour. Trop. Med., 10 (1930), No. 4, pp. 237–241*).—In experimental work conducted by the U. S. Army Medical Department Research Board at the Bureau of Science, Manila, P. I., in vitro experiments made to test for possible germicidal action of the gastrointestinal secretions of the yellow-fever mosquito on *Bacillus typhosus* and *B. prodigiosus* were negative. In vivo experiments to determine the length of life of *B. prodigiosus*, *B. leprae*, *Staphylococcus aureus*, and *Cytoryctes variolae* within the gastrointestinal canal of the yellow-fever mosquito show that these organisms survived for at least 24 hours, but that they could not be demonstrated after an interval of seven or more days. It is considered probable that the yellow-fever mosquito does not regurgitate its midgut contents while feeding.

Since no germicidal action could be demonstrated in the gastrointestinal fluids of the yellow-fever mosquito in vitro, it seems probable that the organisms ingested by the mosquito were not killed as a result of the presence of an active bactericidal principle but that they either failed to find a suitable environment for continued development within the insect and were slowly digested or that they were eliminated with the feces. The disappearance of the organisms tested from the gastrointestinal tract of the yellow-fever mosquito within a short interval of time suggests that the only way in which these organisms could be transferred to the skin of man would be by interrupted feedings repeated at frequent intervals.

Coccidiosis in Anopheles mosquitoes, C. MANALANG (*Philippine Jour. Sci., 42 (1930), No. 2, pp. 279–281, pls. 2*).—A brief account of observations of coccidial infection in adult Anopheles observed during the dry season of 1928 and in June, 1929. In Rizal Province, Luzon, the coccidia were found in adults of all the common species of the genus from the Novaliches water project and the San Francisco malaria-control areas. Of the many routine larva examinations, in only one (*A. tessellatus* Theob., from Laguna Province) was infection noticed. At Tungkong Manga, Bulacan Province, coccidial infection of *A. philippinensis* was so intense as to cause death.

New Jersey Mosquito Extermination Association, sixteenth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 16 (1929), pp. 122, pls. 9*).—The contributions presented at the sixteenth annual meeting of this association (E. S. R., 59, p. 859), held at Atlantic City in February, 1929, include the following: The Work with Mosquitoes around the World in 1928, by L. O. Howard (pp. 6–27); A Summary of Mosquito Control Accomplishment in New Jersey during the Past Year, by F. W. Miller, of the New Jersey Experiment Stations (pp. 28–37); The Nature of the Mechanical Appliances Developed and Used in New Jersey for Mosquito Fighting and the Outlook for Wider Use of This Means of Mosquito Control, by J. E. Brooks (pp. 40–46); A Proposed Solution of the Mosquito and Flood Problem in the Passaic Valley, by C. C. Vermeulf (pp. 46–50); Relation between Toxicity of Oil and Its Penetration into Respiratory Siphons of Mosquito Larvae, by J. M. Ginsburg (pp. 50–61); Activities of the Florida Anti-Mosquito Association, by W. I. Fee (pp. 63–67); The Application of Law to Mosquito Control, the Nature of Legal Principles Involved, and the Process of

Their Application to the Problem of Mosquito Control, by M. M. Stallman (pp. 68–73); The Relation of Rainfall to the Seasonal "Peak Load" of Mosquito Control, by T. J. Headlee (pp. 74–80); Two Years' Study and Practical Use of Crankcase Waste Oil as a Mosquito Larvicide, by J. P. Peterson and J. M. Ginsburg (pp. 92–101); Mosquito Suppression in Canada in 1928, by A. Gibson (pp. 102–107); Salt Marsh Vegetation in Relation to Salt Marsh Mosquito Breeding in the South Atlantic and Gulf States, by T. H. D. Griffitts (pp. 108–115); How Results Were Obtained in Nassau County during 1928, by R. H. Sammis (pp. 117, 118); and Progress in Mosquito Elimination in Connecticut during 1928, by R. C. Botsford (pp. 120–122).

New Jersey Mosquito Extermination Association, seventeenth annual meeting (*N. J. Mosquito Extermin. Assoc. Proc., 17 (1930), pp. 184+[2], pls. 8, figs. 11*).—The contributions presented at the seventeenth annual meeting of this association, held at Atlantic City, N. J., in February, 1930, include the following: The Work with Mosquitoes around the World in 1929, by L. O. Howard (pp. 7–30); Mosquito Suppression in Canada in 1929, by A. Gibson (pp. 31–40); A Summary of New Jersey Mosquito Control Accomplishments of the Past Year, by F. W. Miller (pp. 41–51); The Importance of Back Yard Inspection to the Successful Mosquito Control Campaign, by G. W. Eager, jr. (pp. 52–54); Studies of Pyrethrum as a Mosquito Larvicide, by J. M. Ginsburg (pp. 57–73); The Economic Value of Mechanical Equipment in Various Phases of Mosquito Control: An Account of Past and Present Performances, together with a Forecast of the Future, by F. A. Reiley (pp. 73–80); Aquatic Plants as Factors in Mosquito Control and the Problem of the Food of Mosquito Larvae, by R. Matheson (pp. 81–104) (E. S. R., 62, p. 857); A Progress Report in an Investigation of the Egg-Laying Habits of *Aedes sylvestris*, by F. W. Miller (pp. 105–111); What Are the Prospects of Eliminating Food of Mosquito Larvae from Breeding Pools? by W. Rudolfs (pp. 113–123); A Further Contribution to Knowledge of the Influence of Summer Rainfall upon Mosquito Prevalence, by T. J. Headlee (pp. 124–130); The Value of Educating the Public in the Mosquito Control Movement, by H. N. Prickitt (pp. 131–133); A Statement of Mosquito Control Activities in Nassau County, New York, during 1929, by E. Butchard (pp. 143–145); Anti-Mosquito Work in Connecticut in 1929, by R. C. Botsford (pp. 145–148); A Further Report on the Salt Marsh Problem of the South Atlantic and Gulf States and Malaria Control on a County-wide Basis, by T. H. D. Griffitts (pp. 148–155); The Problem of Obtaining Mosquito Control in Massachusetts, by P. M. Churchill (pp. 155–160); A Report of the Mosquito Control Campaign in Burlington, New Jersey, by Mrs. J. L. Shedaker (pp. 164–169); and A Statement of Accomplishments in the Des Plaines Valley Mosquito Abatement District, Riverside, Illinois, by J. L. Clarke (pp. 170–184).

The nutrition and the action on its host of the chironomid Symbiocladius rhithrogenae, an ectoparasite of ephemerid nymphs [trans. title], R. Codreanu (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 24, pp. 1462–1464*).—An account of the parasitism of the nymphs of *Rhithrogena* sp. by a chironomid larva (*S. rhithrogenae*) which results in the death of the host.

Bee-killing robber flies, S. W. Bromley (*Jour. N. Y. Ent. Soc., 38 (1930), No. 2, pp. 159–176, pl. 1*).—It is pointed out that in North America *Promachus fitchii* O. S. and in Argentina *Mallophora ruficauda* Wied. have been recorded as causing losses to beekeepers. In the United States five genera, Stenopogon, Deromyia, Promachus, Mallophora, and Proctacanthus, contain species which commonly kill bees, while two genera, Bombomima and Erax, contain species which occasionally do so.

Stomoxys calcitrans and its attacks upon horses and cattle in Rumania [*trans. title*], G. Dinulescu (*Ann. Parasitol. Humaine et Compar., 8 (1930),*

No. 1, pp. 71–74, pl. 1, figs. 2).—The stable fly is a serious enemy of cattle in Rumania, being exceedingly abundant in the delta of the Danube and in other regions where the conditions are favorable for its development. Its attack on horses and mules often results in lesions characteristic of dermatitis.

The bionomics of the white triangle leaf-roller Cacoecia persicana Fitch, F. C. Gilliatt (*Sci. Agr., 10 (1930), No. 10, pp. 631–653, figs. 16*).—This is a report of biological studies conducted since 1926 at the Dominion Entomological Laboratory at Annapolis Royal, Nova Scotia, of one of the most important of the lesser orchard insect pests, for which the common name white triangle leaf roller is suggested.

Life history of the belted bean beetle, J. M. Robinson (*Alabama Sta. Rpt. 1928, p. 23*).—In this study 21 broods were successfully reared from July 1, 1927, to June 30, 1928. The incubation period of the eggs varied from 3 to 11 days, with an average of 6.3 days. The active feeding stage varied from 10 to 20 days, with an average of 14.6 days, while the prepupal period varied from 1 to 7 days, the average being 4.4 days. From 5 to 11 days, with an average of 7.6 days, were required for pupal development. From 27 to 43 days, with an average of 33 days, were required for completion of the life cycle from egg to adult.

Studies of the Buprestidae of North Africa [trans. title], A. Théry (*Mém. Soc. Sci. Nat. Maroc, No. 19 (1928); pp. [3]+586, pls. 2, figs. 196*).—This is a synopsis of the Buprestidae of North Africa which includes a catalogue of the forms represented and host and subject indexes.

Morphology, taxonomy, and biology of larval Scarabaeoidea, W. P. Hayes (*Ill. Biol. Monog., 12 (1929), No. 2, pp. 119, pls. 15*).—Following an introduction, this work deals with the morphology (pp. 16–46), postembryonic development and biology (pp. 47–71), and taxonomy (pp. 72–81) of the Scarabaeidae. A bibliography of 3 pages is included.

Some biological notes on a leaf-feeding coccinellid (Epilachna 28-punctata Fabr.), C. C. Chue (*Lingnan Sci. Jour., 6 (1928), No. 4, pp. 301–313, figs. 11*).—This is an account of *E. 28-punctata*, which, in Kwangtung Province, China, is a source of injury to solanaceous plants.

Notes on a bamboo borer (Cyrtotrachelus longimanus F.), H. T. Chen (*Lingnan Sci. Jour., 6 (1928), No. 4, pp. 353–366, figs. 3*).—An account of one of the most destructive insects which attack bamboo in the vicinity of Canton, China.

A review of research on the control of wireworms, C. A. Thomas (*Pennsylvania Sta. Bul. 259 (1930), pp. 52, fig. 1*).—This is an intensive digest of the literature, references to which cover 12 pages. It deals with insecticides used against the larvae, attractants, farm practices, cultural practices, crop rotation, miscellaneous control methods, and control measures for wireworms in Pennsylvania.

The apple-seed chalcidoid wasp (Syntomapsis druparum Boheman): Its occurrence in New Zealand, E. S. Gourlay (*New Zeal. Jour. Sci. and Technol., 12 (1930), No. 1, pp. 61, 62*).—The author reports that the apple seed chalcid does not attack commercial apples in New Zealand. Crab apples have not been examined for its presence, but it has been observed ovipositing freely in the seed of hawthorn (*Crataegus oxyacantha*) and the cockspur thorn (*C. crus-galli*).

Parasitism a stimulus to pupation: Alysia manducator in relation to the host Lucilia sericata, F. G. Holdaway and A. C. Evans (*Nature [London], 125 (1930), No. 3155, pp. 598, 599*).—In studying the parasitism of *L. sericata* Meig. by *A. manducator* Panz. in relation to the stage in which hibernation takes place, it was found that the percentage of parasitism of larvae which had not

pupated within eight days after being brought from the field was negligible. Practically all the parasitism records were obtained from puparia or from larvae which pupated soon after collection. It is suggested that the secretion injected at the time of oviposition which causes temporary paralysis of the host larvae may be the real cause of the stimulated pupation. Of the larvae collected, some pupated a day or two after being brought to the laboratory. Others underwent a tardy pupation on encountering higher temperatures, the larval life of some of them at an average temperature of 15° C. being prolonged to three months. The parasitism records are presented in tabular form.

Parasitism in relation to pupation in Lucilia sericata Meig., W. M. Davies (*Nature [London], 125 (1930), No. 3160, pp. 779, 780*).—The author finds that in Toulouse, France, the normal mode of hibernation of *L. sericata*, excluding the influence of parasitism, is in the larval stage and similar to that found by the author in North Wales in 1928–1929 (E. S. R., 62, p. 157). He failed to observe a single puparium among the hibernating larvae. It is pointed out that the larvae were all obtained directly from living sheep and were not those exposed to baits, as in the work by Holdaway and Evans above noted.

On the polyembryonic development of Macrocentrus gifuensis Ashm. [trans. title], H. L. Parker (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 17, pp. 1022–1024, figs. 7*).—A brief account of a study of polyembryony in a hymenopterous parasite of the European corn borer, previously referred to in a work by Thompson and the author as *M. abdominalis* Fab. (E. S. R., 59, p. 354). This is said to be the first record of its occurrence in a braconid.

List of publications on apiculture contained in the U. S. Department of Agriculture Library and in part those contained in the Library of Congress, compiled by V. E. Hitz and I. L. Hawes (*U. S. Dept. Agr., Library, Bibliog. Contrib. 21 (1930), pp. [4]+218*).—The several parts of this mimeographed bibliography list, respectively, books (pp. 1–66); reprints and separates (pp. 67–82); U. S. Department of Agriculture publications (pp. 83–118); publications of the States, Territories, and Insular Possessions—official and nonofficial (pp. 119–147); laws (pp. 149–163); periodicals, arranged by title (pp. 165–197); periodicals, arranged by country (pp. 199–206); and an index of names (pp. 207–218).

The citrus rust mite and its control, W. W. Yothers and A. C. Mason (*U. S. Dept. Agr., Tech. Bul. 176 (1930), pp. 56, pl. 1, figs. 10*).—This is a report of extended studies of the life history and bionomics and natural and artificial control of the citrus rust mite (*Phyllocoptes oleivorus*). Control work has shown sulfur to be the best agent for use in combating it. Its action is through the fumes from the oxidation of the sulfur, which does not have to be in actual contact with each mite to cause its death.

"Sprays and dusts containing sulfur seem to be about equally effective when compared on the basis of the sulfur content. When used in the form of a lime-sulfur solution at a dilution of from 1–50 to 1–100, it should kill all adults and larvae present at the time and remain effective under any weather conditions for a sufficient time to kill all larvae subsequently emerging from the eggs that had been deposited prior to the spraying. Dusting with sulfur or sulfur and lime mixtures is also effective and may be carried on at any time of the day, but the dust will remain on the trees longer if applied while the foliage is wet with dew. If a drenching rain falls within four days it may be necessary to repeat the dusting before the eighth day after the first application."

Contribution to the study of an acarid, Thrombicula autumnalis Shaw [trans. title], M. André (*Mém. Soc. Zool. France, 29 (1930), No. 2, pp. 39–138, figs. 26*).—The five parts of this work deal in turn with the ecology of this mite

(pp. 39–60), synonymy and systematic position (pp. 60–73), its morphology (pp. 73–89), its mode of nutrition (pp. 89–105), and its development (pp. 105–133). A bibliography of five pages is included.

Studies on Rocky Mountain spotted fever (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 154 (1930), pp. IX+116, pls. 12, figs. 17*).—The papers, by R. R. Spencer and R. R. Parker, relating to this tick transmitted disease and on the transmitting tick (*Dermacentor andersoni*) are as follows: Infectivity of Fasting and Recently Fed Ticks (pp. 1–7); Viability of the Virus in Animal Tissues (pp. 8–10); Experimental Studies on Tick Virus (pp. 10–23) (E. S. R., 53, p. 58); Nonfiltrability of Tick and Blood Virus (pp. 23–27); Vaccination of Monkeys and Man (pp. 28–36) (E. S. R., 54, p. 261); A study of the Relationship between the Presence of Rickettsialike Organisms in Tick Smears and the Infectiveness of the Same Ticks (pp. 36–44) (E. S. R., 55, p. 552); Certain Characteristics of Blood Virus (pp. 44–49); Variations in the Behavior of the Virus (pp. 49–60); Infection by Other Means than Tick Bites (pp. 60–63); Improved Method of Manufacture of the Vaccine and a Study of Its Properties (pp. 63–72); and Results of Four Years' Human Vaccination (pp. 72–103).

Some observations on the bionomics of Fasciola hepatica, I. C. Ross (*Japan. Jour. Expt. Med., 8 (1930), No. 2, pp. 65–69*).—An account of observations on the development of the liver fluke *F. hepatica* in *Limnea pervia* Marten, which was shown in 1925 by Shirai (E. S. R., 56, p. 175) to be the host of this parasite in Japan.

ANIMAL PRODUCTION

The antianemic potency of cane and beet molasses, W. E. Krauss (*Ohio Sta. Bimo. Bul. 147 (1930), pp. 182, 183, fig. 1*).—In this test young rats that had just been weaned were allowed access to all the whole milk they would consume. In addition, one lot received 0.5 gm. of cane molasses and a second lot 0.5 gm. of beet molasses daily. A third group was allowed milk only until anemia developed, after which half were fed cane molasses and half beet molasses at the rate of 0.5 gm. daily. Determinations of the hemoglobin content of the blood of individual rats were made at frequent intervals.

Cane molasses as a supplement to milk produced excellent growth and prevented anemia, and when fed after anemia developed restored the hemoglobin regenerative properties of the blood. On the other hand, beet molasses retarded growth, did not prevent anemia, and had no beneficial effect on rats suffering from nutritional anemia.

Chemical analyses showed that cane molasses contained larger quantities of iron and copper than beet molasses.

Commercial feeding stuffs, 1929–1930, J. M. Bartlett (*Maine Sta. Off. Insp. 136 (1930), pp. 9–36*).—The usual report of the analyses guaranteed and found for protein, fiber, and fat of 586 samples of feeding stuffs collected for official inspection during the year ended June 30, 1930 (E. S. R., 62, p. 160).

Winter feeding and time of marketing steers, J. C. Grimes (*Alabama Sta. Rpt. 1928, p. 12*).—Continuing this study (E. S. R., 60, p. 169), steers fed a ration of cottonseed meal, Johnson grass hay, and a medium allowance of blackstrap molasses for 112 days made larger gains, attained a better finish, and returned more profit than similar steers fed the same ration without the molasses.

For wintering steers Johnson grass hay alone proved satisfactory, but the addition of 2.18 lbs. of cottonseed meal per head daily increased the average daily gains 0.23 lb. It was again found more profitable to limit the winter ration and to finish steers on grass than to full feed during the winter. Adding

7.73 lbs. of cottonseed meal daily to steers being finished on grass increased the daily gains 0.83 lb. per head and also increased the profits.

Steer feeding [at the Kentucky Station] (*Kentucky Sta. Rpt. 1929, pt. 1, p. 33*).—Continuing the comparison of methods of finishing steers (E. S. R., 62, p. 253), it was found that steers wintered on a ration of corn, cottonseed meal, corn silage, and oat straw, and finished on grass without corn gained an average of 333 lbs. per head, while those wintered on the same ration without corn and finished on grass with corn gained 338 lbs. per head. The steers receiving corn during the winter made a slightly higher net return for the 212-day period than those fed corn on grass, but the selling price, dressing percentage, and quality of carcass were practically the same in both lots.

Relative efficiency of calves, yearlings, and two-year-old steers for the producer, C. C. Culbertson, J. M. Evvard, and W. E. Hammond (*Iowa Sta. Bul. 271 (1930), pp. 237–299, figs. 21*).—This study has been continued for two additional years under the same plan as that previously noted (E. S. R., 57, p. 266), except that during the third year corn silage was added to the ration of each group. In the second test the 2-year-olds and yearlings were marketed after 120 days of feeding. At this time they had made average daily gains of 3.2 and 2.98 lbs. per head at a feed cost of $10.09 and $9.77 per 100 lbs. of gain, respectively. The margin over feed cost, excluding hogs, was $15.61 and $19.81 per head in the respective lots. The calves were fed for 270 days, made average daily gains of 2.42 lbs. per head, at a feed cost of $12.09 per 100 lbs. of gain, and returned a margin over feed cost of $40.95 per head. The 2-year-olds and yearlings made average daily gains of 2.42 and 2.47 lbs. per head, respectively, over a 160-day feeding period in the third test, at a feed cost of $13.93 and $11.95 per 100 lbs. of gain, and returned a margin over feed cost of $17.53 and $18.03 per head. The calves fed for 240 days gained 2.32 lbs. per head daily, cost $10.99 for feed for each 100 lbs. of gain, and returned a margin over feed cost of $38.76 per head.

In these studies the steer calves full fed in dry lot until finished for market were more profitable than either the yearlings or 2-year-olds. While the fattening period for calves was longer, they required less feed per 100 lbs. of gain and sold on a higher market than the other classes of cattle. The yearling steers were slightly more profitable than the 2-year-old steers. Greater gains were made by the 2-year-olds than by the calves during the finishing period and slightly greater gains than the yearlings in two of the three comparisons. The 2-year-olds, however, required more feed per unit of gain and sold at a lower price than the calves in all tests and lower than the yearlings in two of the three tests.

Effects of sex, length of feeding period, and a ration of ear-corn silage on the quality of baby beef, S. Bull, F. C. Olson, and J. H. Longwell (*Illinois Sta. Bul. 355 (1930), pp. 165–233, figs. 29*).—This is a more detailed account of work previously noted (E. S. R., 60, p. 253; 62, p. 363).

The deposition of minerals in the bones of calves fed rachitic and antirachitic rations, S. I. Bechdel and O. J. Hill (*Pennsylvania Sta. Bul. 258 (1930), p. 25*).—A ration which had proved rachitic with rats, composed of yellow corn meal, corn gluten meal, oatmeal, commercial casein, calcium carbonate, and salt, with dried sugar beet pulp, was fed to 4 lots of 3 calves each after they were 4 months old. Lot 1 received the basal ration only, lots 2 and 3 were irradiated for 15 minutes daily with a carbon arc lamp, and lot 4 received 25 cc. of cod-liver oil daily. The calves were slaughtered at from 8 to 12 months of age, at which time the percentage of ash in the humeri on a dry fat free basis was 54.23, 59.58, 60.45, and 59.32, respectively. One outstanding case of rickets developed in lot 1.

Raising early lambs from aged western ewes, A. D. WEBER (*Nebraska Sta. Bul. 250 (1930), pp. 31, figs. 12*).—In this study of farm flocks two lots of 100 aged white-faced ewes each were used. One lot was bred to Hampshire rams at the station, while the second lot had been bred to black-faced rams in Colorado before being purchased. The ewes were on pasture without additional feed until October 24, when they were divided into two equal lots and fed either ground ear corn and alfalfa hay or ground ear corn and cut alfalfa hay for 60 days. After lambing the ewes were all fed the same ration. Two lots of the lambs produced were creep fed either a grain mixture high in protein or one low in protein for 112 days.

The ewes fed cut alfalfa hay consumed more feed, made larger gains, and required less feed per unit of gain than ewes fed long hay. Over a 6-month period each ewe consumed approximately 5.6 bu. of ear corn, ground, 10 lbs. of cottonseed meal, 209 lbs. of corn silage, 230 lbs. of cut alfalfa, and 67 lbs. of alfalfa hay, and gained 20 lbs. in live weight. The ewes bred before arriving at the station lambed on the average 7 days earlier than those bred at the station and were ready for an earlier and higher market than the Nebraska-bred ewes. The wool produced by the ewes was only enough to pay for 17 per cent of the feed they consumed.

The lambs on the high protein ration gained 0.04 lb. more per head daily before weaning and 0.08 lb. more after weaning than those on the low protein ration. After weaning the lambs required over twice as much grain per unit of gain as before weaning. In this test each lamb consumed 1.4 bu. of shelled corn ground, 11 lbs. each of linseed meal and bran, and 74 lbs. of alfalfa hay. From the 100 Nebraska-bred ewes 121 lambs, averaging 71 lbs. in weight, were marketed and from the 100 Colorado ewes 95 lambs, averaging 65 lbs., were marketed. There was a difference of about 25 cts. per hundredweight in the selling price of the lambs in favor of those from the Colorado ewes, due to the fact that they were marketed before Easter. The single lambs in this study weighed more at birth and gained more rapidly than the twin lambs.

A comparison of native fine wool lambs, native mutton lambs, and western bred lambs as feeders in Pennsylvania, W. L. HENNING ET AL. (*Pennsylvania Sta. Bul. 258 (1930), pp. 22, 23*).—Continuing this study (E. S. R., 62, p. 365), 6 lots of 28 lambs each were fed for 104 days. Lots 1 and 2 were composed of native fine wool lambs, lots 3 and 4 of native mutton lambs, and lots 5 and 6 of western black-face range lambs. A ration of shelled corn, linseed meal, mixed hay, and iodized linseed meal was fed in lots 1, 3, and 5, and the same ration with the iodine omitted was fed in lots 2, 4, and 6. The average daily gains in the respective lots were 0.165, 0.19, 0.18, 0.21, 0.26, and 0.28 lb. per head.

Sheep, farm and station management, E. H. PEARSE (*Sydney and London: Pastoral Rev. Pty., 1926, 2. ed., rev. and enl., pp. XII+447, figs. 136*).—This treatise deals with the practical side of sheep raising and of farm and station management under conditions as they exist in Australia.

[Experiments with swine at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 258 (1930), pp. 20–22, fig. 1*).—The results of two studies are noted.

Methods of growing pigs, M. A. McCarty, T. B. Keith, and P. C. MacKenzie.—In this study 5 lots of 22 pigs each, averaging 55 lbs. per head, were fed a 2 per cent ration of ear corn 2 parts, 1 part of a mixture of middlings and tankage 9 : 1, and 4 lbs. of skim milk for each pound of the protein mixture for a period of 56 days. Lot 1 was placed on bluegrass, lots 2 and 3 on Dwarf Essex rape, lot 4 on rape and oats, and lot 5 on Sudan grass pasture. The average daily gains were 0.59, 0.67, 0.58, 0.56, and 0.48 lb. per head in the respective lots.

The 2 per cent ration was not liberal enough to promote good gains, and it was necessary to increase the amount fed to the lot on bluegrass pasture to 2.5 per cent.

Fattening rations for swine, M. A. McCarty.—Continuing this study (E. S. R., 62, p. 367) 3 lots of 30 pigs each, averaging 103 lbs. per head, were self-fed free choice for 50 days. Lot 1 received corn, fish meal, and mineral, lot 2 moldy barley, fish meal, and mineral, and lot 3 ground wheat, fish meal, and mineral. The mineral mixture consisted of ground limestone, steamed bone meal, and salt 40 : 40 : 20. The average daily gains in the respective lots were 1.95, 1.2, and 1.79 lbs. per head. Lot 1 required 399 lbs.; lot 2, 465 lbs.; and lot 3, 426 lbs. of feed to produce 100 lbs. of gain. Less protein was required to balance the wheat than either the corn or barley ration. While the moldy barley was unpalatable and increased the amount of fish meal consumed, its low purchase price made it the most economical feed in this test.

In a second test 2 lots of 10 pigs each were fed from an average weight of 57 lbs. to a market weight of 200 lbs. Lot 1 received shelled corn, ground oats, standard middlings, and tankage 4 : 3 : 2 : 1, and lot 2, shelled corn, standard middlings, and tankage 7 : 2 : 1. In addition each lot received an equal amount of mineral. The average daily gains were 1.37 and 1.51 lbs. per head in the respective lots, and the feed required to produce 100 lbs. of gain was 420 lbs. in lot 1 and 393 lbs. in lot 2. Lot 2 reached the final weight 11 days earlier than lot 1.

Hog feeding [at the Kentucky Station] (*Kentucky Sta. Rpt. 1929, pt. 1, p. 32*).—Continuing this study under the same plan as that previously noted (E. S. R., 62, p. 255), a lot of hogs was added to which ear corn was fed on hard ground. The protein supplement fed consisted of tankage, linseed meal, and alfalfa meal 2 : 1 : 1, and in addition all lots had free access to a mineral mixture for a period of 60 days. During this period the pigs fed ear corn from a self-feeder ate 0.65 lb. of mineral mixture, those fed on a platform 0.45 lb., those fed on hard ground 0.15 lb., and those fed in the mud 1.7 lbs. per head. The rate of gain was practically the same in all lots.

Barley as hog feed, W. J. Loeffel (*Nebraska Sta. Bul. 251 (1930), pp. 20, figs. 2*).—The unpublished results of six dry lot tests conducted between October, 1918, and April, 1923, and one pasture test during the summer of 1929 to compare barley and corn for feeding hogs are reported. The average length of the dry lot tests was 77 days, and the pasture test was of 90 days' duration. The average weight of all pigs used was 115 lbs. per head. Tankage was used as a protein supplement in all tests, and in the first four comparisons the pigs had access to alfalfa hay in racks.

These studies showed that when properly supplemented barley could be used to replace all or part of the corn in a ration. When coarsely ground barley was soaked before feeding it was 86 per cent as efficient as corn, while when self-fed dry it was 84 per cent as efficient as corn, pound for pound. Whole barley self-fed was 80 per cent as efficient, but when soaked only 78 per cent as efficient as corn for producing gains. When self-fed either ground or whole barley, pigs consumed more grain than when fed corn, but when ground barley and shelled corn were self-fed free choice the pigs consumed more corn than barley. There were indications that pigs fed barley and tankage were not able to adjust their protein intake as efficiently as when fed corn and tankage. Gains were from 7 to 27 per cent more rapid on corn rations than on barley rations. Feeding soaked ground barley three times daily did not increase the rate or efficiency of gains over feeding twice daily.

Soybeans as a substitute for tankage in fattening spring pigs on legume pasture, C. M. VESTAL (*Indiana Sta. Bul. 341 (1930), pp. 14, figs. 2*).—Concluding this series of six studies (E. S. R., 63, p. 558), it was found that a ration of corn, soybeans, minerals, and legume pasture was capable of fattening March farrowed pigs to a weight of from 200 to 220 lbs. in time for the September market. When the minerals were omitted from the ration, these weights were not usually attained until October. When the minerals were added the daily consumption of soybeans was decreased about 30 per cent, and the consumption of ear corn and the gains in weight were increased. In these studies 1 lb. of soybeans supplemented with minerals was equal to at least 1 lb. of 60 per cent tankage, and about 30 per cent less when fed wihout minerals.

Improving scrub hogs by the use of purebred sires, J. C. GRIMES and W. E. SEWELL (*Alabama Sta. Rpt. 1928, pp. 12, 13*).—In this study it was found that with one exception the length of time and the amount of feed required to produce a 200-lb. hog decreased as the grade of the animal increased. Pigs that were 87.5 per cent purebred reached the final weight 61 days earlier and required 167 lbs. less feed for each 100 lbs. of gain than scrubs. The pigs that were 50 per cent purebred made a better showing than those that were 75 per cent purebred.

Relation of size of swine litters to age of dam and to size of succeeding litters, T. B. KEITH (*Jour. Agr. Research [U. S.], 41 (1930), No. 8, pp. 593–600, fig. 1*).—This study was based on the breeding and farrowing records of the swine herd at the Illinois Experiment Station, accumulated during the years 1903 to 1925. These records include 935 litters containing 8,478 pigs of Duroc-Jersey, Berkshire, Poland China, Chester White, Hampshire, Yorkshire, and Tamworth breeding. The litters were grouped into classes on the basis of the age of the dam, and the dams were classified on the basis of age at time of farrowing, in intervals of 6 months, starting at 10 months of age.

The average size of all litters involved, after eliminating the dams that produced only one litter, was 9.06 pigs. The size of litter usually increased with the age of dam up to about 4.5 years, after which there was a gradual decline in size. While the fertility of a sow was not affected by the age at which she was first bred, this study shows the advisability of breeding the sow young, since more pigs are produced throughout her breeding life by following this practice. Barren sows can also be detected sooner by early breeding.

A significant correlation was found between the size of litter farrowed at a given age of the dam and the size of litter farrowed at later ages. When large numbers of litters were available, a significant relation was found between the size of a given litter and the size of succeeding litters. A high correlation existed between the size of the second litter and the average size of succeeding litters. There was a greater variability in the size of first litters than in the size of second litters. This study also shows that size of litter is a valuable criterion in selection for fertility.

The two-litter hog system on Indiana farms, G. E. YOUNG (*Indiana Sta. Bul. 338 (1930), pp. 35, figs. 11*).—A description of the methods used in the intensive system of hog production, which calls for the raising and fattening of litters of pigs produced in the spring and fall of the same year. This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

A manual for hog raisers, W. J. LOEFFEL (*Nebraska Sta. Circ. 40 (1930), pp. 61, figs. 18*).—A practical handbook dealing with the nutritive requirements of pigs, the nutritive value of the most commonly used hog feeds, the value of different pasture crops, and the efficient management of the swine herd.

[Experiments with poultry at the Kentucky Station] *Kentucky Sta. Rpt. 1929, pt. 1, pp. 29–32, 45*).—The results are reported of several experiments, in continuation of those previously noted (E. S. R., 62, p. 255).

Effects of vitamin D supplements for chickens.—The absence of a vitamin D supplement in the ration materially reduced the egg production of both pullets and yearling hens and brought about a progressive decrease in hatchability. Direct sunlight proved to be more effective than either irradiation or cod-liver oil for increasing egg production and was also the most effective factor in increasing the hatchability of eggs. However, the vitamin D obtained from cod-liver oil or by irradiation was also effective in increasing hatchability.

Supplementing a meat scrap mash with dried buttermilk.—In this study a standard laying mash containing 20 per cent of meat scrap was fed as a basal ration to the check lot. In the test lots the meat scrap content was reduced to 10 per cent, and 10, 5, and 5 per cent, respectively, of dried buttermilk was added. In lot 4 enough steamed bone meal was added to equalize the phosphoric acid content with that in lot 1. The percentage of eggs hatched was 53.8, 50.2, 62.9, and 52.4, the winter production 55.9, 38.4, 29.2, and 32.3 eggs per bird, and the annual production 154.9, 160.4, 132.1, and 129.6 eggs per bird in the respective lots.

Metabolism in the chicken.—Blood analyses showed that in nonlaying White Leghorn hens the arterial and venous blood contained about the same amount of calcium. In hens in an active laying state the blood from the anterior mesenteric vein contained appreciably larger quantities of calcium than the blood from the anterior mesenteric artery, and the blood from the left ventricle had an intermediate value for calcium.

A study of the transference of the proteins in egg white from the cells of the oviduct indicated that the eggshell membranes are impermeable to most, if not all, of these proteins. These indications make it appear that egg white proteins are placed around the yolk before the membranes and shells are formed.

Hens receiving calcium carbonate as a supplement to a ration of ground yellow corn, wheat, middlings, and skim milk throughout the test progressively increased the average number and weight of eggs laid, the average weight of shells, and the percentage of calcium in the blood. Similar hens receiving the ration from which the calcium carbonate was removed showed a decrease in the number and weight of eggs laid, in weight of shells, and in percentage of calcium in the blood.

Confining hens to screened porch.—A lot of Barred Rock pullets allowed a yard range at the Robinson Substation laid an average of 147.9 eggs per bird for 9 months, while a similar lot confined to a screened wire porch averaged 142.1 eggs per bird. There was no significant difference in the thickness of eggshell in the two lots.

[Experiments with poultry at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 258 (1930), pp. 9, 35, 36, fig. 1*).—The results of two studies are briefly noted.

Hock disease of poultry, J. E. Hunter, R. A. Dutcher, and H. C. Knandel.—The results of this study indicate that slip tendon or "hock disease" in chicks is aggravated by excessive mineral feeding, together with the strain of standing on wire or from crowded conditions.

Statistical studies of the variations in the growth of Single Comb White Leghorns and their significance, E. M. Funk.—A study of the weights of 616 chicks showed no relationship between the size of the day-old chick and its subsequent size as determined by weight when the chicks were of uniform breeding and managed in the same way.

The relative value of cottonseed meal and tankage for egg production, L. N. Berry (*New Mexico Sta. Bul. 188 (1930), pp. 19, figs. 3*).—Concluding this study (E. S. R., 63, p. 469), it was found that, while high egg production was secured when cottonseed meal was used as the sole protein supplement in the ration, the quality of the eggs was so poor as to make its use alone inadvisable. A mash containing approximately 15 per cent of tankage and 15 per cent of cottonseed meal gave an average annual return over feed cost of $3.13 per bird, while a mash containing tankage and no cottonseed meal returned on the average $3.09 per bird. With such a small difference and with the detrimental effect of the cottonseed meal taken into consideration, it was deemed inadvisable to use cottonseed meal in the rations of laying hens. When fed in large amounts, cottonseed meal also reduced the hatchability of the eggs.

When compared with a ration so limited in green feed that birds showed symptoms of vitamin A deficiency, the use of alfalfa range increased the average annual return per bird 64 cts.

Final report of fourth Panhandle egg-laying contest, November 1, 1929, to September 25, 1930, O. S. Willham (*[Oklahoma] Panhandle Sta., Panhandle Bul. 21 (1930), pp. 20*).—This is the final report of the fourth Panhandle egg-laying contest, held at Goodwell, Okla. (E. S. R., 62, p. 766.)

Broiler production, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 19 (1930), No. 1, pp. 4, fig. 1*).—The expected costs and returns, together with information on quality of birds and methods of production of broilers, are discussed in this publication.

Judging poultry for production, J. E. Rice, G. O. Hall, and D. R. Marble (*New York: John Wiley & Sons; London: Chapman & Hall, 1930. pp. XII+425, pls. 3, figs. 205*).—This treatise, divided into four parts, principles of production judging, practice of culling and selection, educational facilities in poultry judging, and general information, is designed to bring about a better knowledge of how to judge poultry for vitality and production and to develop an understanding between those interested in commercial poultry and egg production and those interested in the development of fancy birds.

The American standard of perfection (*Amer. Poultry Assoc., 1930, rev. ed., pp. 487, figs. 213*).—This is a revised edition of the treatise previously noted (E. S. R., 18, p. 73).

A new basis of selection, W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 11, pp. 4*).—Selection of breeding stock based on the number of eggs laid during the pullet year, the quality of the eggs laid, and the market value of the eggs produced is described in this publication.

British poultry husbandry, E. Brown (*London: Chapman and Hall, 1930, pp. VIII+350, pls. 32*).—In this treatise the author describes the history of poultry raising in Great Britain, the introduction and development of breeds, the evolution of the use of poultry for food production, and the development of commercial poultry husbandry.

DAIRY FARMING—DAIRYING

Feeding experiments with dairy cows, F. B. Headley (*Nevada Sta. Bul. 119 (1930), pp. 21, figs. 8*).—Concluding this study (E. S. R., 62, p. 72), three groups of five cows each were fed through four years. Lot 1 received alfalfa hay alone, lot 2 alfalfa hay and grain, and lot 3 alfalfa hay and grain during each alternate lactation period. All cows were tested for tuberculosis and abortion.

Adding grain to the ration increased the milk and fat production and enabled cows to maintain their average weight at a higher level. The amount of hay

consumed was reduced by adding grain to the ration. The total digestible nutrients in alfalfa hay and in the grain ration were equally efficient for producing butterfat.

The cows receiving grain required on the average 0.53 extra breeding per conception, while those receiving no grain required 0.73 extra breeding. Cows which reacted to the abortion test required 0.76 extra breeding and the nonreactors 0.5 extra breeding. When the cows were bred to drop their calves less than 340 days apart or if the time between calvings exceeded 380 days, the fat production in the subsequent lactation period was reduced.

A method is proposed for measuring the efficiency of a cow, consisting of dividing the total digestible nutrients consumed during the year by the number of pounds of butterfat produced. Tables are presented showing the feed cost of butterfat with hay and grain at varying prices. A method is also suggested for estimating the conversion factor when the roughage consumption is unknown.

Feeding dairy cows, H. O. HENDERSON and J. V. HOPKINS (*West Virginia Sta. Circ. 56 (1930), pp. 20, figs. 3*).—The principles of feeding dairy cows for economical milk production are outlined in this publication.

How much protein in the grain mixture will return the dairyman most profit? A. E. PERKINS (*Ohio Sta. Bimo. Bul. 147 (1930), pp. 184–191*).—Continuing this study at the Hamilton County Experiment Farm (E. S. R., 63, p. 65), the same plan was used except that the comparisons were made for three periods of two months each. In this phase there was a relatively small difference, 1.9 per cent, in net returns in favor of the 19 per cent protein mixture fed. Such a small difference might easily be affected by feed prices, and on this basis the author shows the effect of fluctuations in the price of the various feeds on the net returns for the two rations.

Pasteurizing milk for calf feeding, C. L. ROADHOUSE and R. L. PERRY (*California Sta. Circ. 319 (1930), pp. 24, figs. 12*).—The use of various kinds of sterilizing and pasteurizing equipment for pasteurizing milk for feeding dairy calves is described. It is suggested that with most types of equipment milk for calf feeding should be heated to a temperature of 170° F. While this temperature is above the minimum required to destroy disease-producing bacteria, the higher temperature overcomes the possibility of mistakes.

Length of gestations in Jersey cows, L. COPELAND (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 257–265*).—This study includes 1,075 gestations of Jersey cows which produced living calves. In determining the length of the gestation period the day on which the calf was dropped was included in the total number of days, but the day of service was not included.

For the cases studied an average gestation period of 278.51 days was found, but the chances appeared equal of a cow calving at any time between the two-hundred-and-seventy-first and the two-hundred-and-eighty-fifth day. The average gestation period for 297 bull calves was 279.48 days and for 282 heifer calves 278.64 days. While the data for twin calves were meager, there were indications that the average gestation period for twin calves was usually several days shorter than for single calves.

The age of the dam apparently had no effect on the length of the gestation period, and no correlation was found between the length of different gestations in the same individual. Calves born after abnormally long gestations appeared to have a better chance of living than those born prematurely.

[Experiments in dairying at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 258 (1930), pp. 26–28, 29, fig. 1*).—The results of several experiments, in continuation of those previously noted (E. S. R., 62, p. 372), are reported.

A test of butterfat in condensed and evaporated milk, W. D. Swope, C. D. Dahle, and F. J. Doan.—For testing sweetened condensed milk a satisfactory

method was found which consisted of using 2 cc. of ammonium hydroxide, 3 cc. of butyl alcohol, and 17.5 cc. of sulfuric acid (3 parts of acid and 1 part of water) added to 4.5 gm. of condensed milk and 4.5 gm. of water. When the fat column was read from the bottom of the lower to the bottom of the upper meniscus, the method checked closely with the Mojonnier method.

For testing evaporated milk 3 cc. of ammonium hydroxide and 4 cc. of butyl alcohol were used with the same amount as above of sulfuric acid and added to 9 gm. of evaporated milk. The same method can be used for testing ice cream and ice cream mixes, but the larger particles in fruit and nut ice cream shall be removed by straining before testing.

The use of dry skim milk in the manufacture of commercial ice cream, C. D. Dahle and J. I. Keith.—The use of three types of dry skim milk in ice cream mixes in which cream and milk constituted the source of butterfat resulted in ice creams scoring as high as controls containing condensed skim milk. The mixes testing 11.7 per cent serum solids which had dry skim milk as the sole source of serum solids scored lower than controls containing cream and condensed skim milk. The spray and vacuum roll process powders scored higher than the atmospheric roll powders, the latter prolonging by several minutes the freezing time and increasing the viscosity and acidity of the mix. Forewarming the fluid milk to 180° F. instead of to 145° before drying did not improve the quality of the ice cream.

The effect of pasteurizing and homogenizing temperatures on physical properties of the ice cream mix, C. D. Dahle and G. S. Barnhart.—Pasteurizing ice cream mixes and homogenizing at 170 and 180° F. resulted in faster freezing time, lower viscosity, greater protein stability, and greatly reduced fat clumping as compared with mixes pasteurized at 150°. When mixes were cooled back to 150° from 170 and 180° before homogenizing, these properties were not affected as much as when homogenized at the higher temperatures. The continuous method of heating proved to be as satisfactory and more rapid than the vat method of heating when the higher temperatures were used. No cooked flavor developed, and there was a greater reduction in bacterial count when mixes were heated to the higher temperatures than when heated to 150° for 30 minutes.

Studies on cream line formation, F. J. Doan.—Evidence indicates that loss of creaming ability in milk is due to the precipitation of calcium, particularly in heated milk. Adding soluble calcium salts to milk that has lost some or all of its creaming ability showed no indication of restoring this power. The calcium lowered the pH value of the milk and destabilized the protein. Sodium citrate had a similar but not such a strong effect on creaming ability, but it increased the pH value and bettered the protein stability.

The effect of the homogenization process on fat dispersion and casein stability of milk and cream, F. J. Doan and C. H. Minster.—The use of a 2-stage homogenizer or double homogenization increased protein stability, decreased viscosity and fat clumping, and increased the pH value of milk slightly as compared with the use of a single-stage homogenizer. Surface tension was irregularly affected by both methods, but when the fat content was higher than 4 per cent there was a tendency for surface tension to be increased by the single-stage homogenizer while in the skim milk the tension usually was lowered.

The stability of fresh 20 per cent cream toward heat was parallel to the degree of fat clumping. Homogenizing table cream and sterile cream increased stability materially when dual homogenization or a 2-stage homogenizer was used. In some cases added solids also increased stability. The temperature of homogenizaton was nearly as important as the preheating temperature in main-

taining maximum stability. Salt stabilizers when used should be added before homogenization.

The anaerobic spore test as an index of contamination in milk, M. H. Knutsen and E. C. Holst.—The anaerobic spore test failed to show any decided degree of accuracy in differentiating milks as to the amount of contamination because the spores germinated after varying periods of time, depending upon the temperature at which the milk was held.

Quantitative changes in the microflora of butter during storage, H. Macy (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 266–272*).—Several lots of butter were available for this study at the Minnesota Experiment Station. Lot 1 represented 63 samples of salted butter made in 8 different creameries in the State, and was put in 1-lb. prints, wrapped, and stored at the creamery for from 1 to 6 days at from 30 to 45° F., and in transit during marketing at from 42 to 67° for from 7 to 8 days. Lot 2 consisted of 55 samples of salted butter made at the State Experimental Creamery during the course of a year and stored for 1 month at from 32 to 35° in 3- to 5-lb. stone jars. Lot 3 represented 68 samples of the same butter as in lot 2, packed in jars and stored for 9 months at from 32 to 35°. Lot 4 was made up of 297 samples of salted butter, mostly in 20-lb. tubs, entered in a storage contest, and stored for 5 months at from −5 to −10°. Lot 5 consisted of 55 samples of unsalted butter from the same churnings and packed and stored in the same manner as lot 2, and lot 6 was made up of 68 samples of unsalted butter handled as in lot 3. Mold, yeast, and bacterial counts were made on the samples before and after storing.

A general tendency was found toward a decrease in counts in salted butters and an equal tendency to increase in counts in unsalted butters during storage. The ratio of increase was higher in the unsalted than in the salted butters, while the opposite was true for the ratio of decrease. While the salt content of butter had a decided effect upon the quantitative changes in the micoflora of butter during storage, the effect was not in proportion to the amount of salt present.

Some observations on processed cheese, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 203–220, figs. 7*).—Continuing this study at the Wisconsin Experiment Station (E. S. R., 63, p. 70), it was found that the use of so-called emulsifiers produced a beneficial effect in the manufacture of processed cheese. Sodium citrate was superior to disodium phosphate in this respect. The use of more than 3 per cent of these salts was deleterious to the resulting product as well as unlawful.

A comparison of the reaction in terms of pH and the titrable acidity was found to be a good indication of the kind of cheese processed and the treatment that it received.

A cheese was considered to have a very desirable body when it could be cut in slices 0.02 in. thick, and required from 800 to 1,200 gm. with a mechanical advantage of 5 to crush an inch cube to one-half of its original thickness.

VETERINARY MEDICINE

[Work with diseases of livestock at the Kentucky Station] (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 22–29*).—In studying sterility in mares, *Bacterium viscosum equi* was isolated from over 50 per cent of the foals examined. Cultures obtained from different animals and in some instances from the same animal showed marked cultural and serological differences. In searching to obtain evidence of the habitat of *B. viscosum equi* outside its occurrence in foals, it was isolated from the crypts of the tonsillar region of two thoroughbred mares aged 22 and 14 years, respectively, and an aged mule. It was also

isolated from the tonsillar crypts and taste buds of a 7-months-old foal and a 17-day-old foal, both of which were affected with a generalized streptococcic infection. It appears that the microbe is nearly always present in the oral cavity of the horse, suggesting the possibility that adult horses actually serve as infection carriers or as reservoirs for this particular infection.

Under the heading of parasites in young foals it is reported that all of 20 yearling foals presented for post-mortem examination since July 1, 1929, were found to be badly infested with nematode parasites. It is pointed out that one of these, *Strongylus vulgaris*, regularly invades the circulatory system with a predilection to lodging in the anterior and posterior mesenteric arteries and their numerous branches. The artery in which the parasite becomes lodged undergoes dilatation, and the intema of the vessel is destroyed, followed by severe inflammation and exudation. "As a result, the distended blood vessel becomes filled with parasites, coagulated blood, and tissue detritus, often completely occluding the lumen of the vessel and thus interfering materially with the circulation of the blood through the area. The inflammatory process extends through the wall of the vessel into the surrounding structures, producing thickened fibrous areas of inflammatory tissue. These so-called verminous aneurysms of the mesenteric artery and the inflammatory tissues surrounding them make in the aggregate large masses of diseased tissue, often from 4 to 6 in. in diameter. Suppurative processes within the accumulated exudate in the diseased blood vessels and in the adjacent lymph glands often contain the microorganism *B. viscosum equi*." Any effective protection of young foals against these parasites must be accomplished through preventive measures.

Work with infectious abortion of cows, mares, and sows is reported upon at some length (E. S. R., 62, p. 262). During the year, 1,437 cows in 85 herds and 44 mares were tested for infectious abortion. Bacterin from *Brucella abortus* sufficient for 1,052 cows in 50 herds was sent out, and 2,571 mares on 76 farms received the bacterin treatment. In a study of the culture of *B. abortus* isolated from the afterbirth of a cow that gave premature birth to a weak calf, subcultures made from two of the three colonies that developed grew aerobically in the fourth generation, and the other subculture grew aerobically in the fifth generation. It is pointed out that in isolating the *B. abortus* from aborting sows (1916) the first generations grew aerobically, differentiating the strains isolated from cows, which required several generations of growth in a partial oxygen pressure before they developed aerobically. The passage of the bovine organism through the sow did not seem to change its adaptability to grow only under partial anaerobic conditions for the first few generations. Agglutinins for the swine strains of *B. abortus* developed in the serum of the sow over those of bovine origin. Peculiarly, no agglutinins developed in the sow for the bovine strain injected.

The losses in one flock of sheep were definitely determined to be due to poisoning by waterhemlock (*Cicuta maculata*), while losses in another flock stopped as soon as the sheep were removed from a pasture that contained many plants of the jimson weed (*Datura stramonium*).

The results of a study of acidosis in pregnant ewes extending over a period of years indicate that the problem is fundamentally one of nutrition. The blood from ewes suffering with acidosis showed a calcium content below that of ewes that were being fed a well-balanced ration and in which no case of acidosis occurred. There appears to be a decided difference in the ability of individual animals to maintain the calcium content of the blood when kept under the same conditions and fed the same kind of feed.

In agglutination tests for bovine abortion made from April 15 to December 31, 1929, of more than 3,000 samples of blood the first test showed 25 per cent to be reactors.

In laboratory examinations of 1,541 specimens from diseased animals coccidiosis was recognized in cattle, sheep, swine, chickens, and dogs, that in the sheep and pigs being the first time for these animals in the State. The inflammatory changes in the intestines of pigs where coccidia were found were different from those previously observed in cases of enteritis and colitis in swine.

Fowl paralysis has become increasingly prevalent in the State, it having been relatively rare prior to 1929. The affected birds first show incoordination, which progresses to partial paralysis. Both wings and legs may be affected, and frequently the neck also is involved, but complete paralysis has not been observed. This disease occurs in birds ranging from 5 to 12 months of age. During the first part of the season from 80 to 90 per cent of the cases showed an infestation of coccidia, while later tapeworms were found in at least 75 per cent of the cases. All the cases of fowl paralysis that have been examined showed chronic enteritis. Thus far it has been impossible to transmit the disease experimentally.

Serological studies of bacilli of the paratyphoid B group isolated from an outbreak of an acute disease in chicks showed *Bacterium aertrycke* and *B. anatum* to be present.

Fleming's veterinary obstetrics, rev. by J. F. Craig (*London: Baillière, Tindall & Cox, 1930, 4. ed., rev., pp. VIII+552, figs. 168*).—This is a revised edition of a work on obstetrics first issued in 1879 and reissued in 1882 and 1885. It includes the diseases and accidents incidental to pregnancy and parturition.

Lessons on tropical parasites and diseases, I, II, A. Garcia-Rivera (*Lecciones de Parasitologia y Enfermedades Tropicales. Habana: Cultural, S. A., 1930, vols. 1, pp. XX+663, figs. 244; 2, pp. [XVI]+846, pls. 6, figs. 154*).—Volume 1 of this work, consisting of 35 lessons, deals with the arthropods and helminths, and volume 2, consisting of 43 lessons, with the pathogenic protozoa, filtrable viruses, vegetable parasites, and noninfectious diseases met with in the tropics.

***Human helminthology*: A manual for clinicians, sanitarians, and medical zoologists,** E. C. Faust (*Philadelphia: Lea & Febiger, 1929, pp. XXII+17-616, figs. 297*).—The first section of this work deals with the scope of helminthology in 6 chapters (pp. 17–64), section 2 with the Platyhelminthes or flatworms in 13 chapters (pp. 65–304), section 3 with the Nemathelminthes or roundworms in 11 chapters (pp. 304–492), and section 4 with helminthology and the diagnostic laboratory in 4 chapters (pp. 493–582).

[Effect on deer of browsing on laurel and rhododendron], E. B. Forbes and S. I. Bechdel (*Pennsylvania Sta. Bul. 258 (1930), pp. 39–41, fig. 1*).—The results of a series of feeding experiments involving 23 deer of less than 1 year of age conducted in a specially constructed experimental plant in a woodlot on the college farm are reported upon. The work was carried on in cooperation with the State Board of Game Commissioners.

Mountain laurel (*Kalmia latifolia*) and rhododendron (*Rhododendron maximum*) were found to be eaten with considerable freedom by deer, especially in times of feed shortage, but as eaten seem not to be poisonous as they are to cattle and to sheep. Young deer, approaching 1 year of age, when held in confinement showed that they did not like laurel and rhododendron, and if allowed grain in addition would eat very little of these plants. When restricted to laurel or rhododendron alone (without grain) the young deer would not eat

enough of either to maintain the live weight, but when restricted to these two and grain for 49 days they remained contented and in good health.

In the force-feeding of laurel leaf a deer was just able to tolerate and to recover from the effects of this plant in a quantity equal to 1.29 per cent of its live weight, while another deer was killed by the force-feeding of 1.75 per cent of its live weight of laurel leaf. Thus, the toxic principle of laurel and rhododendron is poisonous to deer, though they seem not to eat of their own free will enough of either of these plants to exceed their tolerance for this substance. It appears, therefore, that late fawns are restricted, in seasons and in regions of feed shortage, to the less palatable and less nutritious feeds, especially to laurel and rhododendron, and under these conditions many have died, apparently as a result of malnutrition, cold, pneumonia, and rickets.

Bovine piroplasmosis in central Russia, Union of Socialistic Soviet Republics [trans. title], W. L. Yakimoff and M. J. Scheinoff (*Arch. Wiss. u. Prakt. Tierheilk., 59 (1929), No. 5, pp. 444–450; abs. in Trop. Vet. Bul., 18 (1930), No. 1, pp. 9, 10*).—Since 1924, when *Piroplasma bigeminum* was the only cause of piroplasmosis found in Russia, five additional forms have been discovered. These are *Babesiella bovis* Babes 1888, *B. karelica* Yak. 1926, *Françaiella occidentalis* Yak. and Burzeff 1927, *F. caucasica* Yak. and Belawin 1926, and *F. colchica* Yak. 1927.

Psittacosis: Observations concerning the experimental disease in parrots, mice, rabbits, guinea-pigs, and monkeys, T. M. Rivers, G. P. Berry, and C. P. Rhoads (*Jour. Amer. Med. Assoc., 95 (1930), No. 8, pp. 579–583, figs. 5*).—It has been found that the virus of psittacosis occurs in the feces and in the material collected from the nose, mouth, and procrop of infected parrots. Parrots and monkeys can be infected by intranasal instillations of the virus. Parrots and rabbits that have recovered from a primary infection are refractory to reinfection. It is not a simple matter to demonstrate neutralizing properties in convalescent human serum. In parrots and in mice the principal lesions occur in the liver and spleen. Young monkeys (*Macacus rhesus*) are susceptible to intracerebral, intratracheal, and intranasal inoculations of psittacosis virus. When it is instilled in the nose or injected in the trachea, a characteristic pathologic picture occurs in the lungs which is similar to that observed in man.

Undulant fever (Bang) of man, G. Spengler (*Die Bangsche Krankheit beim Menschen. Berlin and Vienna: Urban & Schwarzenberg, 1929, pp. 55, figs. 2*).—This account is presented in connection with a 3-page list of references to the literature. The first part (pp. 2–15) deals with the bacteriology and epidemiology of undulant fever, and the second part (pp. 15–51) with the clinical nature of the disease—its prevention and treatment.

Undulant fever in Ware County, Ga., G. E. Atwood and H. E. Hasseltine (*Pub. Health Rpts. [U. S.], 45 (1930), No. 24, pp. 1343–1354*).—Nine out of 11 cases of undulant fever occurring in 1929 in Waycross, Ga., and investigated epidemiologically are reported upon. The evidence obtained indicates that these cases were due to the porcine strain of *Brucella abortus* coming through the milk supply.

Recent progress in studies of undulant fever, H. E. Hasseltine (*Pub. Health Rpts. [U. S.], 45 (1930), No. 29, pp. 1660–1667*).—A review of recent work with this disease in man.

Economic aspects of contagious abortion in a dairy herd (*Nebraska Sta. Research Bul. 46 (1930), pp. 54, figs. 10*).—This is an analysis of data collected from the herd records kept by the department of dairy husbandry of the college and station from October, 1896, to January 1, 1929. Following a review of the literature and history of the herd, the economic importance of abortion is re-

ported upon under the headings of occurrence of abortion, effect of abortion on breeding efficiency, effect of abortion on milk and butterfat production, and financial losses due to abortion. The details of the study are largely presented in tabular and chart form.

Nasal granuloma of cattle in Bihar and Orissa, P. N. DAS (*India Dept. Agr. Mem., Vet. Ser., 4 (1928), No. 4, pp. 139–147*).—This work has been noted from another source (E. S. R., 61, p. 472).

Textbook of the diseases of sheep, T. OPPERMANN (*Lehrbuch der Krankheiten des Schafes. Hanover: M. & H. Schaper, 1929, 3. ed., pp. XII+325, figs. [109]*).—This is the third edition of the work previously noted (E. S. R., 47, p. 883).

Investigations on mal de caderas, its treatment with Naganol-Antimosan and the question of transmission [trans. title], J. SEEGERT (*Arch. Schiffs u. Tropen Hyg., 34 (1930), No. 2, pp. 99–123, figs. 14*).—It has been observed in Brazil that a wire fence used to separate infected from healthy horses will prevent the spread of the causative trypanosome of mal de caderas, *Trypanosoma equinum*. Trypanosomes have been found in leeches at watering places of infected animals.

[Diseases of poultry and their control] (*World's Poultry Cong., London, 4 (1930), Conf. Papers, Sect. C, pp. IV+343–534, pls. 6, figs. 23; Résumés, pp. 43–68*).—The conference papers relating to diseases of poultry and their control presented at the Fourth World's Poultry Congress (E. S. R., 59, p. 369), held at London from July 22 to 30, 1930, include one from Belgium, A Disease of Pigeons Due to a Germ of the Salmonella Group, by J. Lahaye and R. Willems (pp. 343–346); five from Canada, Insect and Other External Parasites of Poultry in Canada, by A. Gibson (pp. 347–351); A Study of the Causes of Mortality in Groups of the Single Comb White Leghorn and Barred Plymouth Rock Breeds of Fowl, including a Comparison between Production and Mortality, by C. H. Weaver (pp. 352–361b); Some Observations on the Variable Pathogenicity of Tubercle Bacilli from Avian and Mammalian Sources, by C. A. Mitchell, C. W. McIntosh, and R. C. Duthie (pp. 362–372); Incubator Disinfection in the Control of *Salmonella pullorum*, by F. N. Marcellus, R. Gwatkin, and J. S. Glover (pp. 373–378); and Parasites and Parasitic Diseases of Economically Important Waterfowl, by A. B. Wickware (pp. 379–385); two from France, The Fight against Infectious Diseases of Poultry in France, by A. Staub and C. Truche (pp. 386–388), and The Work of the Alfort Station for the Study of the Hygiene and Pathology of Small Livestock, by G. Lesbouyries (pp. 389–392); four from Germany, The Principal Diseases of Poultry in Germany and Their Control, by R. Reinhardt (pp. 393–397); Bacillary White Diarrhoea—Fowl Typhoid, by H. Miessner (pp. 398–403); Poultry Tuberculosis, by K. Beller (pp. 404–409); and Bird Pox (Bird Diphtheria) and Its Combat, by W. Zwick (pp. 410–419); four from Great Britain and Northern Ireland, Bacillary White Diarrhoea (B. W. D.), by T. Dalling and G. H. Warrack (pp. 420–426); Fowl Pox, by T. M. Doyle (pp. 427–432); Gapes (Syngamiasis)—The Relation of Wild Birds to the Disease among Chicks, by E. L. Taylor (pp. 433–438); and Avian Coccidiosis, by D. C. Matheson (pp. 439–444); one from Hungary, The Control of Bacillary White Diarrhoea and Avian Tuberculosis in Hungary, by R. Manninger (pp. 445–450); one from India, Ranikhet Disease: A New Disease of Fowls in India Due to a Filter-passing Virus, by H. Cooper (pp. 451–467); one from the Irish Free State, Blackhead or Infectious Entero-hepatitis in Turkeys, by J. F. Craig (pp. 468–471); three from Italy, Research and Observations on Some Diseases of Poultry, by A. Lanfranchi (pp. 472–475); The Incidence of Poultry Diseases in Italy during

the Last Three Years, by the Ministry of Public Health, Rome (pp 476–478); and Diseases of Small Livestock in the Po Valley, by P. Stazzi (pp. 479, 480); one from Japan, The Nature of the Parasitic Nodules in the Caecal Wall of Fowls and the Development of Heterakis Vesicularis, by S. Itagaki (pp. 481–483); one from the Netherlands, Combating Coccidiosis, by B. J. Krijgsman (pp. 484–487); and eight from the United States, Inheritance of Resistance to Pullorum Disease, by L. E. Card and E. Roberts (pp. 488–493); Recent Developments in the Importance and Control of the Intestinal Roundworm, *Ascaridia lineata* (Schneider) of Chickens, by J. E. Ackert (pp. 494–500); The Present Status of Pullorum Disease Control in the United States, by L. F. Rettger (pp. 501–507); Research Work of the Bureau of Animal Industry on Poultry Diseases, by J. R. Mohler (pp. 508–514); Studies in the Transmission and Control of Pullorum Disease, by H. Bunyea and W. J. Hall (pp. 515–521); Fowl Typhoid, by L. D. Bushnell (pp. 522–526); The Epidemiology of Fowl Cholera, by L. T. Webster (pp. 527, 528); and The Life Histories of Some Roundworms Parasitic in Poultry, by E. B. Cram (pp. 529–534). Résumés of these papers are published under separate cover.

[**Work with diseases of poultry at the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 258 (1930), pp. 9, 10, 28, 29, 35, 36*).—In a study of the effect of various concentrations of nicotine on the growth and development of fowls, J. E. Hunter and D. E. Haley found that by building up a tolerance to tobacco in baby chicks it was possible to feed them for 16 weeks on a ration containing as much as 1.2 per cent of pulverized tobacco containing 5 per cent nicotine with no harmful effects. The birds under the tobacco treatment even appeared to be stimulated and make better growth than the control birds on the same ration without the addition of tobacco.

In the agglutination studies of pullorum disease, by R. P. Tittsler, a 1 per cent suspension of *Salmonella pullorum* prepared by the Hopkins tube method was found to contain 10,000,000,000 organisms per cubic centimeter, the three strains used giving almost identical results. No difference was noted between standard nutrient agar with or without sodium chloride or proteose-peptone agar. Since considerable variation was noted in ordinary Hopkins tubes, only standardized tubes should be used.

In autopsies made by Tittsler of 73 birds affected with big liver disease of fowls, the number and condition of internal organs affected varied greatly. Pathological changes were noted in any one or all of the following organs: "Liver, spleen, ovary, kidney, and skin. The liver and spleen were enlarged, mottled with fattylike areas, and either soft or extremely tough. Many livers and spleens weighed over 200 gm. and 20 gm., respectively. The affected ovaries were either partly or completely replaced by 'tumorous' tissue. The kidneys were always enlarged, congested, and, in a few instances, tumorous. A few cases showed skin 'tumors.' No bacterial infection has been found. Direct smears, heart infusion agar, liver infusion agar, proteose-peptone agar, and dextrose broth gave negative results. No relationship to bacteria or parasites has been noted."

In a histopathological study made by J. Furth of certain internal organs, abnormal growths, and sections of bone marrow of fowls affected with big liver disease, three types of leucemic condition seemed to be associated with the disease, as reported by E. W. Callenbach, one of which appears to be inherited. This has led to the careful checking of pedigrees of all birds dying from big livers or allied causes in an attempt to discover susceptible or entirely resistant families. While quite severe, the mortality from big livers and associated tumors was not as great in 1930 as in 1929.

In work on control of coccidiosis by E. M. Funk the mortality in chicks artificially inoculated with coccidia was reduced from 65 to 5 per cent by keeping the feed free of the droppings of the chicks. Forty-one out of 63 chicks died from coccidiosis in a pen where open hoppers were used and the feed contaminated with droppings. In another group of 63 chicks only 3 died from coccidiosis when feed hoppers were used which prevented the droppings from mixing with the feed. Frequent removal of the litter reduced the mortality from 38 to 52 per cent to 5 per cent. Changing the litter each week was as effective as removing the litter twice weekly. In both cases the mortality was only 5 per cent, even though the pens contained chicks which had been artificially inoculated with the coccidiosis organism. Wire floors were also of assistance in reducing mortality. Clean feed, clean pens, and wire floors were not 100 per cent effective in controlling coccidiosis, but these sanitary measures materially reduced the losses from this disease.

Infectious bronchitis, F. R. Beaudette and C. B. Hudson (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 12, pp. 4*).—A practical account of infectious bronchitis of poultry, first encountered by the senior author in New Jersey in 1923 and known to exist in the United States for about 10 years.

The losses from the disease in New Jersey and other States were very high during the winter of 1924–25, since which time it has appeared annually and undoubtedly is more common than ever. The average mortality is at least 20 per cent, and a loss as high as 70 per cent has occurred. Birds of all ages appear to be equally susceptible, but under natural conditions it usually attacks fowls under a year old or young chicks. The hens on an infected plant usually escape the infection even though they have contact with diseased birds. It is caused by an ultravisible virus which has been kept by the authors in dried form for 47 days. A water or glycerin solution of virus at room temperature is, however, rendered inactive in a few days, while at 22° F. it remains active for a long time. Recovered birds are immune to subsequent infection.

Miscellaneous parasites, F. R. Beaudette (*New Jersey Stas. Hints to Poultrymen, 18 (1930), No. 10, pp. 4, fig. 1*).—Four parasites, including the feather mite (*Liponyssus sylviarum*) and the roundworms *Tetrameres americana*, *Capillaria annulata*, and *Dispharynx spiralis*, are considered. The feather mite, which was frequently encountered in New Jersey during the last two years and was also found to infest fowls received from New York and Rhode Island, lives on the host all the time and is capable of doing more damage than the common red mite. The author has found that a 1 to 10 dilution of 40 per cent nicotine destroys the mites when sprayed on the feathers on the under side of the body.

T. americana infests the proventriculus of the fowl, the female being embedded so deeply in the gland of the stomach that it is nearer the outside than the inside wall of the organ. When several parasites are present, the wall of the proventriculus becomes greatly thickened, and with this there is destruction of the glandular tissue. As many as 30 females have been found in one bird. The male species, which resembles a very slender cecal worm, appears to be rare. Reference is made to the findings of Cram (E. S. R., 62, p. 381) that the differential grasshopper serves as an intermediate host. It is pointed out that only one infestation by this parasite has been found in south Jersey.

C. annulata infests the mucosa of the esophagus and crop. A heavy infestation by it results in the thickening and sloughing of the lining membrane. Since there are no definite symptoms induced, infestation is usually discovered only by accident. Only two infestations by it have come to the author's attention, one from Maplewood, N. J., and the other from Mamaroneck, N. Y., the pullets infested in the former case having been brought in from Pennsylvania.

In this country the parasite was first described in turkeys and later in ruffed grouse. Infestations in chickens have been reported from several southern States, and more recently quail have been found to be infested. There is no known treatment for the parasite, the life history of which has not been determined.

D. spiralis occupies the cavity of the proventriculus and is surrounded by a thick mucus. It was introduced into New Jersey in breeding quail trapped in the South in 1928, and has been found in the State in this host. Previously the parasite has been reported in carrier pigeons and in ruffed grouse. It also occurs in turkeys, chickens, guinea fowls, and pheasants. It is pointed out that Cram has found an isopod (*Porcellio scaber*) to serve as an intermediate host (E. S. R., 63, p. 155).

Duck disease studies, II, III, P. A. SHAW (*Soc. Expt. Biol. and Med. Proc.*, *27 (1929), No. 2, pp. 120–122; 27 (1930), No. 4, pp. 275–278, figs. 2*).—This is a further study of affections of the duck (E. S. R., 62, p. 269).

II. *Feeding of single and mixed salts*.—Preliminary data obtained in the forced feeding of salts and mixtures of salts such as are known to occur naturally in some of the disease areas are reported. Pintail ducks of both sexes weighing from 600 to 800 gm. were used for the experiments, in which the salts were fed in solution ordinarily, by means of a pipette, but in some instances dry in capsules.

"The results indicate that less than 5 gm. of sodium chloride is nontoxic, while 6 gm. or more is lethal, the time required to produce death decreasing as the dose is increased. Toxicity appears after administration of 1.5 gm. magnesium chloride, but an amount approximately 4.5 gm. is required for a lethal dose. Calcium chloride totaling 1.4 gm. was nontoxic, while 4.8 gm. was lethal in 35 minutes."

III. *Salt content of soils in disease and non-disease areas*.—In this study, "the amounts of nitrate ions from disease and nondisease areas alone show a marked difference, being practically zero in nondisease areas studied, while from 50 to 250 mg. per 10 gm. of soil were found in all but 2 of 11 samples from the 3 disease areas examined. This observation is particularly significant in view of the marked toxicity noted in ducks as a result of artificial feeding with salt mixtures of sodium chloride and sodium sulfate, containing nitrate ions and also magnesium or bicarbonate ions."

It is pointed out that nitrate may play an important part in the incidence of duck disease. Since sodium nitrate is several times more soluble than the corresponding chloride and sulfate, it may be expected to become an appreciable factor in the surface alkali only at the hottest and driest time of the year. It is pointed out that nitrate is also increased at this time of the year through bacterial decomposition of organic matter.

The diseases of the muskrat, A. E. WOODHEAD (*Amer. Fur Breeder, 3 (1930), No. 1, p. 30, fig. 1*).—A brief account in which particular mention is made of a coccidian parasite.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Alabama Station], M. L. NICHOLS (*Alabama Sta. Rpt. 1928, pp. 19, 20*).—Experiments with field machinery in seven counties indicated that the 2-mule cultivator and combination planter and fertilizer distributor are the most needed equipment in this section. It was found that one man could plant and cultivate 60 acres with this equipment. The pipe-gang, large-wheel, pivot-axle cultivator was found to be best adapted to work on bedded or furrow crops. This should generally

be equipped with a set of 10-, 12-, and 16-in. sweeps and disk hillers. Bedding may be done satisfactorily with a cultivator, in which case a bedding bar is desirable. The fertilizer side dressing attachments were found satisfactory where new process nitrates were used, but not with gummy or sticky fertilizer. The cultivator was found to be well adapted to digging peanuts when equipped with half buzzard-wing sweeps. Surveys of farm practice on the sandy land of Crenshaw County showed that "pointrows" could be eliminated by running the rows across the terraces on gentle grades. The maximum grade found where this practice was followed was on land having a slope of 14 per cent. Experiments showed that this practice was satisfactory where cotton was planted flat or where a low bed was used.

Experiments conducted in several parts of the State with a new type of terrace consisting essentially of the combination of a low mound and a shallow ditch indicated that this type of terrace can be constructed for less than one-half of the cost of the old type, broad-base Mangum terrace, and that it gives less trouble by breaking, in addition to being easier to cross.

Experiments with various equipment for plowing under vetch showed that the rolling coulter attached to walking plows was the practical and economical equipment for the 1- or 2-mule farmer. Where sulky plows were available, the combination jointer and coulter was most satisfactory, in that the field was left in a cleaner condition. Experiments in threshing showed that a standard threshing machine with a cylinder speed of 300 to 350 r. p. m. was satisfactory for threshing vetch.

[Agricultural engineering investigations at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 258 (1930), pp. 13, 14*).—An investigation, conducted by J. E. Nicholas and R. U. Blasingame on about 38 different farms in various parts of the State showed that there were as many different types of electric milk refrigerating machine installations as there were farms visited. Tests made on more than half of these indicate that no two machines gave the same results, varying from 4 to 26 gal. of milk cooled per kilowatt-hour. It was found that agitation of the water in the cooling vat increases the rate of cooling.

Tests of a continuous feed grinding and mixing plant indicated that a ton of any required ration can be made in less than four hours, with an approximate power consumption of 15.5 kw. hours. The time and power required depend largely on the ration of mix required and the fineness of the grain ground. Both the common 4-ply flat canvas belt and a V-type cog belt were used to drive the mill.

In tests of accessories for use with tractors in plowing stony soils, made by H. B. Josephson and Blasingame, a caterpillar type tractor and a subsoiler were employed with success for removing stones which interfere with plowing. Rock ledges were dynamited, then pulled. A quick coupling hitch spring release was adapted to plowing in stony ground.

Water survey of Texas County, Oklahoma, H. W. Houghton (*[Oklahoma] Panhandle Sta., Panhandle Bul. 20 (1930), pp. 30, fig. 1*).—A survey of the waters from 70 wells of the county is reported, including the results of chemical analyses. The water levels found in the county appear to be very uniform throughout, varying from very deep wells in the western part to shallower wells in the eastern part. Also, in most cases, the wells are deeper in the northern parts of the county than in the southern part. The water sands generally keep their relative positions throughout the county with a few breaks in the region of the Palodnro.

It is certain that the water can not arrive at these depths by merely penetrating the soil as the clay formations and rock formations beneath the soil and above the water are practically impervious to water. It is conjectured that much of this water passes into the water sands from the watershed as it comes from the mountain regions to the west. Also, it is thought that much of it arrives in the water sands from the large rivers due to rains and snows. Apparently the existence of sheet water was not established.

Surface water supply of lower Mississippi River Basin, 1927 (*U. S. Geol. Survey, Water-Supply Paper 647* (*1930*), *pp. IV+98, fig. 1*).—This report, prepared in cooperation with the States of Missouri, Colorado, Kansas, and Texas, presents the results of measurements of flow made on streams in the lower Mississippi River Basin during the year ended September 30, 1927.

Surface water supply of Hawaii, July 1, 1925, to June 30, [1927] (*U. S. Geol. Survey, Water-Supply Papers 635* (*1930*), *pp. V+145; 655* (*1930*), *pp. V+151*).—These reports, prepared in cooperation with the Territory of Hawaii, presents the results of measurements of flow made on certain streams and ditches in the Territory during the years ended June 30, 1926 and 1927.

Surface irrigation in the Eastern States, F. E. STAEBNER (*U. S. Dept. Agr., Farmers' Bul. 1635* (*1930*), *pp. II+38, figs. 25*).—This supersedes Farmers' Bulletin 899 (E. S. R., 38, p. 788). It gives practical information on surface irrigation with special reference to its use in the agriculture of the States.

Effectiveness of moisture-excluding coatings on wood, G. M. HUNT (*U. S. Dept. Agr. Circ. 128* (*1930*), *pp. 28, figs. 8*).—This circular brings together the results of various experiments made at the Forest Products Laboratory by different investigators on the moisture proofing of wood by coatings and impregnation treatments.

No method or material has yet been discovered which will completely prevent moisture changes in wood, but it has been found practical, by the use of suitable coatings, to reduce the rate of moisture absorption very materially and thus reduce, if not entirely eliminate, some of the troubles due to moisture changes.

The most effective moisture-resistant coatings found for wood were those containing aluminum leaf between coats of other materials such as paint, varnish, or the like. For exterior exposure linseed oil paint was found very effective for use with the aluminum leaf because it stood up well under weathering. For interior use with the leaf either varnishes, enamels, or paints were found suitable. Coatings of varnish, enamel, or paint containing aluminum powder were next in effectiveness to aluminum-leaf coatings. Such coatings, when properly applied and maintained, reduced the rate of moisture change in wood so that when exposed to practically saturated air for two weeks only about 5 to 10 per cent as much moisture entered the coated wood as entered similar wood uncoated. Good paints of the linseed oil, bituminous, or asphaltic type, containing aluminum powder, maintained their effectiveness throughout long periods of exposure to the weather. Some of the best coatings of the linseed oil-aluminum powder type maintained better than 90 per cent effectiveness after more than two years' exposure to the weather. The moisture-excluding effectiveness of red lead and orange mineral pigment paints increased notably with increasing percentage of pigment, and a still further increase was effected by the addition of aluminum powder.

Of the many asphaltic, bituminous, and similar paints tested, a few were very effective. Spar varnishes were found moderately effective in retarding moisture changes. Wood properly dried and then varnished on all sides fluc-

tuated much less in moisture content under changing atmospheric conditions than unvarnished wood. In using spar varnishes, increasing effectiveness was observed as the number of coats increased. Dipped coatings were more effective than brushed coatings. Oven-dried coatings were similar in effectiveness to air-dried coatings. The addition of pigments to varnishes made them more effective. Varnishes made with artificial resins of the bakelite type appeared to be superior in moisture-excluding effectiveness to ordinary spar varnishes, but generalizations concerning the artificial resin varnishes tested are not deemed dependable since their composition was not known. High effectiveness was found in a proprietary paint said to contain a lead suboxide as its principal pigment.

Thorough impregnation with sugar, while ineffective in preventing moisture changes, greatly reduced dimension changes with changing moisture content. The moisture-excluding effectiveness of impregnation treatments as compared with coatings was not adequately studied, but the indications are that deep impregnation is not so necessary as a continuous film over the surface. Coatings or treatments with linseed oil, floor wax, and the like, were low in effectiveness.

Why some wood surfaces hold paint longer than others, F. L. Browne (*U. S. Dept. Agr. Leaflet 62 (1930), pp. 4, figs. 3*).—Practical information is given on painting, especially on selecting the kinds of wood that hold paint coatings most satisfactorily. It is pointed out that the density, or weight per unit volume, of a softwood board measures roughly its ability to hold paint coatings because boards are heavy or light according as they contain much or little summer wood.

Gluing wood in aircraft manufacture, T. R. Truax (*U. S. Dept. Agr., Tech. Bul. 205 (1930), pp. 58, pls. 15, figs. 19*).—This bulletin, prepared in cooperation with the U. S. War and Navy Departments, gives specific information about the gluing of wood that is directly applicable to aircraft. A list of 28 references to literature bearing on the subject is included.

Sources of power on Minnesota farms, W. L. Cavert (*Minnesota Sta. Bul. 262 (1930), pp. 72, figs. 3*).—The results of a questionnaire survey of sources of power on 541 Minnesota farms are presented and discussed in detail. These indicate that horses are the most important source of power from the standpoint of horsepower hours actually utilized in the farm business. Next are the tractor, the automobile, the truck, the stationary gas engine, electricity, and the steam engine. Considering the total power used in the farm business and by the farm family, the automobile is more important than horses. Of the total power used by the farmer and his family on 538 farms, about 30 per cent was furnished each by the automobile and by horses, nearly 25 per cent by tractors, about 7 per cent by trucks, 5 per cent by stationary gas engines, and less than 3 per cent by electric motors and steam engines.

Electricity on Maine farms, C. H. Merchant (*[Augusta]: Maine Dept. Agr., 1929, pp. 24, figs. 5; abs. in Maine Sta. Bul. 353 (1929), pp. 141–143*).—This bulletin lists the uses of electricity on Maine farms and discusses the energy required for operating the more common mechanical equipment. The results of a questionnaire survey of the use of electricity on 80 Maine farms are also reported and discussed, and a report is included on the use of electricity on an experimental electrified farm.

Operating ensilage cutters and husker-shredders with electric motors, T. E. Hienton (*Indiana Sta. Circ. 174 (1930), pp. 4, figs. 3*).—The results of tests of 13-in. silage cutters to determine the practicability of driving them with a 5-h. p. motor are briefly reported. The results indicate the necessity of using

sharp knives and changing them twice daily. They should be set so as to run as closely as possible to the shear plate without striking it. The shear plate should be replaced when the edge becomes worn or rounded off. The motor should be of 5-h. p. capacity, 1,800 r. p. m., 220 volts, single phase unless 3-phase service is available, and 60 cycle unless other must be used. A 7.5-h. p. motor may be advisable where 16-in. or larger cutters are used, but should be avoided because of the usual additional capacity charge. The speed of the cutter should be as slow as will elevate the corn into the silo at full load. The 12- or 13-in. cutter is best suited for use with the 5-h. p. motor. Larger cutters may be used where height of elevation is not great, but only with very careful feeding. The clearance at the tip of the fan wings should not exceed 0.125 in. and at the sides not over 0.5 in.

Tests of husker-shredders indicated that a 2-roll machine was the largest size which could be operated by a 5-h. p. motor. Very little additional capacity could be secured by using the 7.5-h. p. motor with this particular machine.

The use of a small electric motor in silo filling, E. E. BRACKETT and E. B. LEWIS (*Nebraska Sta. Circ. 42 (1930), pp. 10, figs. 3*).—An account is given of experience on silo filling with small electric motors on three Nebraska farms, indicating the utility of the 5-h. p. motor for such work where the silage is elevated as high as 37.5 ft. However, the results indicate that to use the small motor efficiently the farmer must have a silage cutter with a drum of large diameter and a fan that revolves in such a manner that the edges and sides of the blade clear the drum by a very small allowance. In addition the blower pipe should not be over 6 or 7 in. in diameter. Not over 30 tons of silage should be cut before sharpening and readjusting the knives. The knives must be set up as close to the shear plate as possible without striking, and the speed of the cutter must be as low as possible to elevate to the necessary height.

Installation of motor-driven feed grinders, T. E. HIENTON (*Indiana Sta. Circ. 173 (1930), pp. 4, figs. 4*).—Practical information on the proper installation of motor-driven feed grinders is given in this circular.

Fighting the corn borer with machinery in the two-generation area, C. O. REED, R. B. GRAY, L. H. WORTHLEY, and D. J. CAFFREY (*U. S. Dept. Agr. Circ. 132 (1930), pp. 50, figs. 36*).—This is a contribution from the U. S. D. A. Bureaus of Public Roads and Entomology and the Plant Quarantine and Control Administration, and the Ohio State University. It gives practical information on corn borer control with machinery in areas where the corn borer passes two generations annually.

Grain drying at a country elevator, W. M. HURST and R. H. BLACK (*U. S. Dept. Agr. Circ. 127 (1930), pp. 15, figs. 4*).—A general discussion of the moisture content of grain and the need for grain driers is followed by a brief description of a commercial grain drier, by data on its cost of operation, and by data from moisture, test weight, and dockage determinations. Data on the increase in market value of wheat due to drying are also included.

Farm bulk storage for small grains, M. A. R. KELLEY and E. G. BOERNER (*U. S. Dept. Agr., Farmers' Bul. 1636 (1930), pp. II+46, figs. 51*).—This explains the losses in grain due to the faulty construction of storages, and gives practical information on better building methods. Designs for several types of storages for small grains adapted to wheat belt conditions are also presented.

The mechanical dairy cooler on Nebraska farms, E. E. BRACKETT and E. B. LEWIS (*Nebraska Sta. Bul. 249 (1930), pp. 22, figs. 12*).—The results of investigations of four installations of the walk-in type of mechanical dairy cooler are reported. No conclusions are drawn, but practical factors to consider when building a cold room are discussed.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Alabama Station, 1927–28] (*Alabama Sta. Rpt. 1928, pp. 16–19*).—Comparison of the prices received by farmers for 2,632 bales of cotton in 1926–27 and 2,076 bales in 1927–28 with the spot cash prices in Montgomery for the same grades on the same days showed that the local prices averaged 0.94 ct. per pound lower in 1926–27 and 0.22 ct. in 1927–28. No staple differences in local prices were apparent for $\frac{13}{16}$-, $\frac{7}{8}$-, and $\frac{15}{16}$-in. cotton. Frequently variations as high as $10 per bale occurred for the same grade and staple on the same day.

Data from 31 Marshall County poultry flocks for 1927 showed that the average net return per farm, making no deduction for labor, was $205. The farms with egg production costs below 20 cts. per dozen had an average production of 166 eggs per bird, and those with costs above 20 cts., 115 eggs. The farms producing about 50 per cent of their eggs from September to February, inclusive, received an average return of 51 cts. per hour of labor, and those producing only about one-third of their eggs in the same period received 22 cts. per hour.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 147 (1930), pp. 200–202, fig. 1*).—Investigations are reported as follows:

Decrease in number of Ohio farms, J. I. Falconer (pp. 200, 201).—A map is presented showing by counties the decrease in the number of farms from 1920 to 1930, as shown by the 1930 census reports. Each county showed a decrease, the percentages ranging from 1 to 63.7 and averaging 14.4 for the State. Seventeen counties showed decreases of 20 per cent or over.

Index numbers of production, prices, and income, J. I. Falconer (p. 202).—The table previously noted (E. S. R., 63, p. 884) is brought down through August, 1930.

[Investigations in agricultural economics at the Pennsylvania Station, 1929–30] (*Pennsylvania Sta. Bul. 258 (1930), p. 12*).—An analysis of cow-testing association records for 237 herds, by P. I. Wrigley, showed that milking machines saved over 19 hours of labor per cow per year, equivalent to 0.3 hour per hundredweight of milk, and that the labor for herds of from 5 to 9 cows cost $7.40 per cow more than that for herds of 20 or more cows.

A study of the prices received by and the costs of marketing to 450 potato growers throughout the State in 1928 showed that the average net price per bushel received (gross price less cost of marketing) by different marketing methods were for house delivery 60 cts., huckster at farm 54, consumer at farm 80, curb market 50, market house 46, retail store 64, hotels and restaurants 61, chain store 50, city buyer f. o. b. shipping point 46, local shipper f. o. b. shipping point 41, and commission 54 cts.

Post war interrelations between agriculture and business in the United States, L. H. Bean (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. 21, figs. 10*).—This mimeographed article—a paper read at the Second International Conference of Agricultural Economists (E. S. R., 63, p. 601)—presents "certain selected facts bearing on the complex economic interdependence of agriculture and business in the United States." The facts presented indicate that income from farm production in one year in a large measure determines purchases the following season in certain industries, such as the fertilizer, farm implement, and automobile and truck industries; that industries engaged in the distribution and processing of farm products are more concerned with the volume of farm output than the money value of farm income; that the variations in the industrial and financial activity of the country are real and im-

portant elements in the well-being of farmers; that factors making for agricultural depressions, particularly overproduction, may temporarily stimulate national prosperity; and that factors giving the appearance of agricultural prosperity, such as relatively high farm product prices, may help to bring on industrial depression.

Types of farming in Indiana, E. C. YOUNG and F. F. ELLIOTT (*Indiana Sta. Bul. 342 (1930), pp. 72, figs. 17*).—In this study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, the physical, biological, and economic factors determining types of farming are discussed, and maps are included showing by counties the soil groups, precipitation, acreage in crops per male of population over 10 years of age in 1925, percentages of the farm area in the chief crops in 1924, and number of hogs, cattle, sheep, and chickens and hundredweight of butterfat sold per 640 acres in 1924. The 11 types of farming areas in the State are described, and charts are included showing for each the changes from 1889 to 1928, inclusive, in percentages of the area in leading crops. Using approximately 6,500 records taken in 30 representative townships, the typical farming systems for farms of different sizes in the several areas were determined and are shown in tables. Ways in which these typical systems may be used in determining profitable long-time farming systems, in interpreting the annual agricultural outlook, and in research work are discussed.

Farming systems for eastern Washington and northern Idaho, G. SEVERANCE, B. HUNTER, and P. A. EKE (*Washington Col. Sta. Bul. 244 (1930), pp. 83, figs. 12; also Idaho Sta. Bul. 173 (1930), pp. 83, figs. 12*).—This study of those portions of the wheat area of eastern Washington and northern Idaho having an average annual precipitation exceeding 18 in. was made in the summer of 1929 by the Washington and Idaho Experiment Stations in cooperation with the U. S. D. A. Bureau of Agricultural Economics. The study is based upon data obtained in the section, results of experimental work at the experiment stations of the two States, and an earlier economic study of part of the same area based on farm records for the years 1919–1921.

Practically small grain farming exclusively for 35 to 50 years in the area has resulted in a loss of at least 35 per cent of the organic matter of the soils, 25 per cent of their nitrogen, and much of their moisture-absorbing capacity, and soil erosion has become a serious menace. Five cropping systems using sweetclover, peas, and alfalfa but continuing wheat production as the major enterprise are presented, (B) peas one year, wheat one year, (C) sweetclover one year, wheat two years, (D) sweetclover one year, wheat three years, (E) sweetclover one year, wheat two years, and peas one year, and (F) alfalfa three years, wheat four years, and new alfalfa seeded alone one year; and the estimated returns are compared with those from the fairly standard 2-year system of wheat alternated with summer fallow (A).

The estimated labor incomes on a 320-acre farm with 300 acres of crop land handled by one man with a 9-horse equipment using binder, mower, and stationary thresher with the different cropping systems are (A) $91, (B) $1,422, (C) $895, (D) $1,329, (E) $758, and (F) $609. The estimated acreage of crop land that can be efficiently handled and the estimated labor incomes on such acreage with a 9-horse equipment where the harvesting of the wheat and peas is done with a combined harvester-thresher under the different cropping systems are (A) 374 acres and $1,120, (B) 244 acres and $1,832, (C) 294 acres and $1,455, (D) 392 acres and $3,036, (E) 392 acres and $2,387, and (F) 400 acres and $1,919. The estimated labor incomes from the different farming systems on a 640-acre farm with 600 acres of crop land with a 25-drawbar horsepower tractor and combined harvester-thresher are (A) $2,468, (B) $5,425,

(C) $3,613, (D) $4,677, and (E) $3,856. The estimated acreage of crop land that can be handled efficiently and the estimated labor incomes using tractor and combined harvester-thresher equipment are (A) 830 acres and $3,407, (B) 538 acres and $4,693, (C) 585 acres and $3,443, (D) 780 acres and $6,395, and (E) 780 acres and $5,158. The adaptability of the several cropping systems and the effect of different prices for wheat on labor incomes are discussed.

Budgets are also presented including either sheep, hogs, dairy cattle and hogs, or dairy cattle and poultry with the E cropping system. These showed that sheep and dairy cattle may prove profitable on a long-time basis on farms where sweetclover has a prominent place in the cropping system, provided that the loss from bloat is not excessive, that a fair quality of hay can be made from second-year clover, and that the yield of wheat following the clover is about as high where clover is pastured from May 1 to late in September as where it is plowed under in late May or early June. For hog production to be profitable, it was found that the price of pork must be relatively high as compared with the price of wheat. Poultry seemed to offer a much better means than hogs of using the skim milk where dairy cattle were raised.

Successful farming practices in the Billings beet region, E. J. BELL, Jr. (*Montana Sta. Bul. 232 (1930), pp. 44, figs. 15*).—This bulletin is a final report on farm management surveys made in 1915 (E. S. R., 47, pp. 490, 491), 1925, and 1926. The changes and present status of the farming system, crops and cropping practices, and livestock production practices are described. A comparison is made of the man labor distribution on an 80-acre irrigated farm with no winter feeding or extensive dairying and the same farm if 12 cows were milked and if 60 steers or 800 lambs were fed. The farm organization, crop and livestock returns, expenses, and farm and labor incomes are shown for 14 successful farms.

Economic history of the Newlands irrigation project, F. B. HEADLEY and C. VENSTROM (*Nevada Sta. Bul. 120 (1930), pp. 30, figs. 13*).—The annual census reports of the project taken by the U. S. Reclamation Bureau, 1912–1929, are compiled and analyzed. The census included the acreage irrigated, acreage and yield of various crops, and the numbers of livestock of different kinds on the project.

Economic status of drainage districts in the South in 1926, R. D. MARSDEN and R. P. TEELE (*U. S. Dept. Agr., Tech. Bul. 194 (1930), pp. 48, figs. 2*).—This bulletin reports the results of a study made in 1926 of the costs of draining and utilizing lands, the rate and degree of land development, sale and settlement of lands, conditions influencing settlement, the financial status of the districts, the types of farming practiced, and other factors in 30 drainage districts in the lowlands of the lower Mississippi Valley, 9 in the Coastal Plain of the Carolinas, and 19 in Florida. The districts studied were organized between 1903 and 1921, and in each case the major portion of the land was unimproved at the beginning of reclamation and of little value for agriculture without drainage.

The study indicates that in the regions studied there are about 6,500,000 acres of land assessed for drainage but yielding practically no return therefor, that if utilization proceeds at the average rate at which it has proceeded in all the districts studied 26 years will be required for complete utilization, that if development proceeds at the average rate for all the districts for the period 1920–1926 complete development will require about 40 years, and that if utilization takes place at the rate at which it has taken place during the period 1920–1926 in the districts studied in Missouri, Arkansas, and Mississippi (the region of greatest success in bringing drained land into use) complete utilization will be reached in about 16 years. A more profitable agriculture than

obtains at present, sales to farmers rather than to persons unqualified by experience, resources, and temperament, farm units large enough to provide a reasonable standard of living for the farmer's family, and development of improved farms by the owners of unimproved land are some of the needs set forth in order to bring about utilization of the new unutilized land.

Property taxation in selected towns in the forest land regions of Minnesota, R. C. HALL and P. A. HERBERT (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 9 (1930), pp. [13]+37+[39], pl. 1*).—Tables are included and discussed showing the area and appraised value of land by cover classes, distribution and appraised value of cleared and forest land by classes of property, comparison of assessor's "full and true" value with appraised value by property and cover classes, real estate taxes as levied by property classes, tax delinquencies, and other physical and economic data for selected towns in 5 counties of Minnesota, with a view to portraying in detail the actual conditions current in 1926 and 1927.

Motor trucks on New York farms, C. W. GILBERT (*New York Cornell Sta. Bul. 507 (1930), pp. 55, figs. 2*).—This study is based on data regarding 97 trucks used primarily for farm purposes on 48 dairy and 49 fruit farms. Sixty-four of the trucks were of 1-ton capacity, 15 0.5- or 0.75-ton, and 18 1.25- or 1.5-ton. Tables are included and discussed showing by items the costs of operating trucks and the factors affecting such costs, the relations of use to costs of operation, and the relative costs of hauling with trucks and horses. The reliability of trucks and the advantages and disadvantages of trucks for farm use are also discussed.

The average cost of operation, exclusive of driver, was $237.82 per year and the average distance driven annually 2,413 miles. Costs having little relation to work done—license, interest, insurance, etc.—made up 24.6 per cent of the total cost; costs depending on, but not proportional to, work done—depreciation and repairs—57 per cent; and costs proportional to work done—gasoline and lubrication—18.4 per cent. Cost per mile, exclusive of driver, decreased from 27.8 cts. where less than 1,000 miles were driven to 6.4 cts. where over 4,000 miles were driven, averaging 11.3 cts. Cost per ton-mile decreased from 39 to 9.6 cts., averaging 19.2 cts. Cost per ton hauled decreased from $2.67 where less than 120 tons were hauled during the year to 41 cts. where over 480 tons were hauled. The average total cost per ton-mile, including driver, was 28.8 cts. as compared with 66.4 cts. with horses, including driver. Trucks displaced an average of 3 months of hired labor and 1.2 horses on the 97 farms, the greatest saving being where 1-ton or larger trucks were used.

Cost of combine harvesting in Minnesota, G. A. POND and L. B. BASSETT (*Minnesota Sta. Bul. 266 (1930), pp. 31, figs. 7*).—Detailed results of studies relating to the cost of operation of combines in Minnesota during the harvest season of 1928 and 1929 are presented in this bulletin. The engineering and agronomic phases of the work in 1928 have been previously noted (E. S. R., 62, p. 447).

The studies indicate that farms on which combines are used are more than three times as large as the average of the farms in the counties in which they are located, have 15 per cent more of the area in crops, and 11 per cent more of this crop area in small grain. Crops harvested amounted to 479 acres per combine on the farms studied. Twenty-three per cent of this was custom work. Seventy-eight per cent of the acreage harvested was windrowed before combining.

The average rate of harvesting with an 8-ft. combine is 2.1 acres per hour; with a 10-ft., 2.5 acres; with a 12-ft., 3.1 acres; and with a 16-ft. combine, 4 acres per hour. The usual length of work day in combining standing grain is

8 hours and in combining windrowed grain 9 hours. The average rate of cutting grain with a 12-ft. horse-drawn windrower is 2.7 acres per hours; with a 12-ft. tractor-drawn machine, 3.8 acres per hour; and with a 16-ft. tractor-drawn windrower, 5 acres per hour.

The average purchase price of an 8-ft. combine was $785, of a 10-ft. combine $1,438, of a 12-ft. combine $1,754, and of a 16-ft. combine $2,290. The average purchase price of a 12-ft. windrower was $257 and of a 16-ft. windrower $394. The average price of a pick-up attachment for a 10- or 12-ft. combine was $87 and for a 16-ft. combine $121.

The average cost per acre of cutting and threshing grain with an 8-ft. combine was $1.53, with a 10-ft. size $1.74, with a 12-ft. size $1.75, and with a 16-ft. size $1.60. The average cost of windrowing grain with a 12-ft. windrower was 46 cts. per acre and with a 16-ft. combine 44 cts. per acre. The average cost of cutting grain with a binder and threshing with a stationary thresher was $3.45 per acre in northwestern Minnesota with an 8-ft. binder, $4.83 per acre in southwestern Minnesota with an 8-ft. binder, and $5.53 in southeastern Minnesota with a 7-ft. binder.

The principal advantages of the combine over the binder-thresher method of harvest are saving of man labor; reduction of total costs; speeding up the harvesting operations; and on grain farms, the spreading of the straw on the land. The principal disadvantage of the combine are the difficulty of reducing the moisture content of the threshed grain sufficiently that it may be stored safely and the loss of the straw. Most of the difficulties in reducing the moisture content of the threshed grain can be overcome by the use of the windrower. The lowering of the quality of the straw and the cost of its recovery are the principal difficulties in adapting the combine to livestock farms.

Steer prices in relation to Idaho beef producers' problems, R. B. Heflebower (*Idaho Sta. Bul. 172 (1930), pp. 32, figs. 15*).—Charts are presented and discussed showing for beef steers monthly prices at Chicago, 1900–1930; annual average prices at Chicago and Portland and index of wholesale prices, 1910–1929; and monthly prices, 1910–1929, at Chicago and Portland adjusted for changes in wholesale price level. With a view to assisting in the forecasting of steer beef prices one year in advance, a multiple correlation study was made for the period 1910–1927 (1917 and 1918 not included) of the relation of annual deflated Portland prices and the number of beef cattle, direction of price change, Middle West corn-hog ratios the previous fall and the previous spring, and the growth of the demand for beef. An index of 0.916 with a standard error of 57 cts. per hundredweight was obtained. Charts are included showing the effects of each of the five factors. Charts are also included showing the relation of current hog prices, Middle West corn prices, business activity, normal seasonal movement of steer prices, and Idaho hay prices to the monthly prices of steers at Portland.

Trading in corn futures, G. W. Hoffman (*U. S. Dept. Agr., Tech. Bul. 199 (1930), pp. 82, figs. 13*).—The materials for this study were compiled chiefly from the records of the Grain Futures Administration regarding the Chicago market.

The first part of the study is limited to an analysis for the 5-year period October 1, 1923, to September 30, 1928, inclusive, of the importance of future trading in corn, annual supplies of corn in the United States in their relation to corn prices, the total volume of trading and total open commitments in corn futures compared to future prices, and deliveries and deliverable supplies compared to prices.

The second part of the study analyzes in detail for the period October 1, 1924, to September 30, 1928, inclusive, the daily and weekly activities on the Chicago

Board of Trade and the methods of (1) small and medium sized speculative traders as shown by data from 15 clearing firms, none of which were known to handle any large volume of hedging trade nor any large speculative accounts; (2) 69 individual speculators, each having a market position in corn futures of 500,000 bu. or more at some time during the period; (3) 67 hedging accounts reaching the same level during the period; and (4) 17 of the 69 speculators who reached a market position of 2,000,000 bu. or more at some point during the period.

Some of the important results found in the study follow: The annual level of corn prices as well as corn futures prices is determined mainly by the size and quality of the crop, the demand for corn, and the general level of prices for all commodities. Future trading is related to the general changes in price by being stimulated by them and by an anticipation of them, and it is frequently built up to an extent that prices are carried beyond the point to which they would otherwise have gone only to react later to abnormal levels in the opposite direction. Smaller fluctuations in price occurring from day to day and from week to week are frequently affected purely by trading activity. Correlating price range and volume of trading by days for the 5-year period gave a coefficient of +0.73.

The conditions under which contracts can be fulfilled as the delivery month is approached and during the month of delivery affect futures price, current futures prices tending to fall relative to the more distant futures immediately prior to the delivery month and to rise during the delivery month. The current futures price is also affected by the deliverable supplies during the delivery month, being relatively high if the supplies are small and relatively low if the supplies are large.

During the first two years of the period October 1, 1924, to September 30, 1928, the large scale speculative group (500,000 bu. or more) was not in the market to any large extent and its position correlated only slightly with the course of futures prices. The small and medium sized group revealed a small inverse relationship, and the hedging group no relationship. During the last two years the large speculators came into the market to build up a large long position, and there was a pronounced positive relationship between their position and futures prices. The combined position of the small and medium sized group moved inversely to the course of prices, and the hedging group again revealed no relationship. The combined position of the group of hedging accounts compared by weeks with the course of the United States visible supply of corn was found to move inversely to the visible supply. The combined position of the 17 leading speculators (2,000,000 bu. or more) compared with prices gave a direct correlation as pronounced as that for the enntire group of large scale speculators. The degree of concurrence of position with price was 61 per cent for trades of 500,000 bu. or over, 72 per cent for trades of 2,000,000 bu. or over, and 100 per cent for trades of 4,000,000 bu. or over.

[Cooperative strawberry marketing associations] (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 8–10*).—In a study of the 10 associations of the State it was found that labor costs comprised about two-thirds of the total expenses in 1929, that size of the business and the method of paying the manager materially affected both labor and total costs, and that the daily pool is better adapted to Kentucky conditions than either the seasonal or car pools.

Roadside markets, C. B. SHERMAN (*U. S. Dept. Agr. Leaflet 68 (1930), pp. II+6, figs. 5*).—Some of the matters to be considered in operating a roadside market are briefly discussed.

Crops and Markets, [October, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 10, pp. 377–424, figs. 3*).—A report on the 1930 feed outlook is

included, together with reports, charts, summaries, tables, and notes of the usual types.

Ohio agricultural statistics for 1929, G. S. RAY, R. E. STRASZHEIM, and A. R. TUTTLE (*Ohio Sta. Bul. 460 (1930), pp. 46, fig. 1*).—Statistics for 1929 with comparative figures for previous years are given for the leading field crops, truck crops, fruits, different kinds of livestock, poultry and dairy prices, farm prices of farm products, and farm wages. The bulletin was prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

Vocational trends in a rural high school, C. J. GALPIN and F. N. MATHER (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. 24*).—This mimeographed report is intended to bring up to date the study of the occupational trends in the student body of Union Academy of Belleville, N. Y., a rural high school, previously noted (E. S. R., 46, p. 386).

Tables are included showing for each student from a farm, 1919-1929, for each student taking the course in home making, 1922-1929, and for each student taking the courses in agriculture, 1901,-1929, the present occupation, whether now living on a farm in the Belleville area, on a farm in other areas, or in village, town, or city, whether still a student in the academy or in college or other school, and whether a college of agriculture has been attended. The respective tables show the total number of students to be 152, 85, and 265; on farms 70, 43, and 135; in villages, towns, or cities, 79, 42, and 120; and still students in the academy or other college or school 55, 35, and 22. Of those taking courses in agriculture, 22 have attended a college of agriculture.

The cost of clothing the Nebraska farm family, J. O. RANKIN (*Nebraska Sta. Bul. 248 (1930), pp. 22, figs. 9*).—This study is based chiefly upon the survey previously noted (E. S. R., 57, p. 685) and analyzes the expenditures for clothing in 328 farm families consisting of 107 owners, 58 part owners, 156 tenants, and 7 hired men. Tables and charts are given showing the clothing costs per home, per person, and per person of different ages and sexes in the groups having total home expenditures of under $1,200, $1,200–$1,799, $1,800–$2,399, and over $2,399. Other tables show the expenditures for different ages and sexes for different kinds of clothing and make comparison of the findings in this study with those of similar studies in rural areas of other States and in cities.

The average cost for clothing in the 328 families included in the present survey was $197, or $49 per person, an amouut about equal to that found in other studies for city wage earners and low-salaried persons. The average expenditures for all men and boys in the present study were for outer garments $28, under garments $3, footwear $13, and accessories $3, total $47. The averages for women and girls were $29, $7, $14, and $2, respectively, total $52. The average expenditures per family of the Nebraska farm families in the present study were less than those in 13 of the 14 other States where similar studies have been made.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Teaching agricultural vocations, R. M. STEWART and A. K. GETMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2. ed., pp. IX+377, figs. 8*).—This is the second edition of the volume previously noted (E. S. R., 57, p. 887).

Film strips of the U. S. Department of Agriculture (*U. S. Dept. Agr., Misc. Pub. 91 (1930), pp. 7, figs. 6*).—This is a price list, including data as to the requirements and prices for making film strips from local pictures.

FOODS—HUMAN NUTRITION

Preserving fruits by freezing.—I, Peaches, J. G. Woodroof (*Georgia Sta. Bul. 163 (1930), pp. 46, figs. 19*).—This bulletin describes in detail the methods which have been developed at the station for the frozen storage of peaches, an industry now being developed commercially in the State. Various freezing terms are used with the following meanings: Slow freezing applies to the use of temperatures ranging from the freezing point of the product to 0° F., sharp freezing refers to freezing to temperatures ranging from 0 to −10°, quick freezing to temperatures below −10°, and instant freezing to temperatures ranging from −80 to −100°. The term cold pack refers to packing prepared foods for freezing and frozen pack to putting frozen food in containers or wrappers.

In the process as developed, all preparation of the peaches for serving is done before they are frozen. The peaches are picked at the soft-ripe stage and prepared as soon as possible. A storage room with constant temperature at about 30° is considered desirable to take care of any fruit that can not be handled immediately. Treatment with lye at a concentration not exceeding 10 per cent and at temperatures below 140° has been found the most satisfactory method of peeling the fruit. The pitting is done by hand, since no satisfactory mechanical method has yet been developed. Slicing is done mechanically, and the containers are filled either mechanically or by hand, depending upon the type of can, condition of the fruit, and manner in which it is to be served. Sliced peaches to be slow, sharp, or quick frozen are placed as closely together as possible in the containers. In the instant freezing process the slices drop directly from the slicer or a metal belt which immediately exposes them to a temperature ranging from −80° to −100° and are then mechanically removed and placed in containers. For sweetening, complete coverage with from 30 to 35 per cent sugar sirup has thus far proved most satisfactory.

In packing peaches for freezing, the general trend during the past few years has been from large to small containers, with individual 4-oz. containers the most popular size at present. Paper board, glass, and tin containers are all being used for frozen peaches in the State. The advantages and disadvantages of each and of different types of caps are discussed, and various wrapping materials suitable for containers or for wrapping frozen fruit mixtures are listed.

Three general types of refrigerants have been used in the experimental work: (1) Brine, usually from calcium chloride, (2) cold blast, caused by passing air rapidly over cooled coils and from there through tiers of filled containers, and (3) carbon dioxide snow. It has been found that the lower the temperature within practical limits the better the product, and for this reason freezing temperatures of from −50 to −100° are recommended, with subsequent storage at about 10°.

For retailing frozen peaches, three types of refrigerants are suggested: A display case with solid carbon dioxide, an electric or gas refrigerator, and an ice box, using ice and salt or calcium chloride.

For home serving of frozen peaches, the 1-lb. containers are recommended if the material is to be defrosted and the individual 4-oz. containers if served frozen. "Whether the frozen product should be allowed to defrost in the closed container, in the serving dish, or be eaten frozen is being debated. We believe the frozen product should be allowed to defrost to the temperature at which it would be desirable to cool fresh peaches before serving, or to the temperature at which it is desirable to eat ice cream. Precaution should be taken against letting it stand for any length of time in open containers after it is completely defrosted."

Preservation of fruits and vegetables by freezing storage, M. A. Joslyn (*California Sta. Circ. 320 (1930), pp. 35, figs. 12*).—This circular, which supersedes Bulletin 324 (E. S. R., 44, p. 207), summarizes briefly, with references to the literature on the subject, the principles of freezing storage, the extent of the industry, its possibilities and limitations, the present commercial methods used, and improved methods which have been developed in the fruit products laboratory of the university and noted previously from other sources.

In discussing the freezing storage of nonacid vegetables, particular emphasis is placed upon the possible danger of botulism poisoning unless the vegetables are frozen promptly and rapidly and prepared and consumed directly after thawing. "They should never be eaten or even tasted before cooking and should be destroyed if any evidence of spoilage appears before or during cooking."

The possibilities and limitations in freezing storage are summarized as follows: "The fact that large quantities of fruit can be packed rapidly, simply, and with relatively small investment for machinery and containers permits the use of freezing storage in years of large crops as a means of preserving some of the surplus. However, while the methods and equipment are relatively simple, extensive cold storage space is required. The cost of storage naturally increases with the length of storage. Not only the storage but also the distribution of the product requires refrigeration. The product must not only be kept frozen during transit and distribution to the retailer, but must also be kept frozen by the retailer. Moreover, housewives have to be instructed in the proper use of the frozen product. Thus the development of the industry may be limited not only by the cost of refrigeration facilities but also by their availability. The chief justification of freezing as a means of preserving foods lies in the better preservation of color and flavor. In many cases this will amply justify the increased cost of packing and distribution."

Dehydration of grapes, P. F. Nichols and A. W. Christie (*California Sta. Bul. 500 (1930), pp. 31, figs. 7*).—The dehydration of grapes in California is limited chiefly to the production from Thompson Seedless grapes of a new type of raisin called the Golden Bleached Thompson. The dehydration of natural seedless and muscat raisins is recommended only for the prevention of rain damage or the salvage of fruit already slightly damaged, and the dehydration of wine or juice grapes and table grapes is not recommended at present. This publication is, therefore, concerned chiefly with methods developed for dehydrating Thompson Seedless grapes.

The general requirements are given for equipment, including dipping equipment, trays, trucks, sulfur houses, and the dehydrator itself. The various steps involved in the dehydration consist in selecting suitable fruit, which should be well matured and of a creamy to golden yellow color, dipping in lye solution of suitable strength containing a small proportion of oil, sorting out bunches showing off-color, spreading the fruit on trays, sulfuring, drying in the dehydrator, and unloading the dried fruit into boxes for storage. Following a general description of these processes, experimental data are reported and discussed on the effect of various factors upon yield and quality of product, including maturity, dipping, particularly with respect to the use of oils and oil substances in the dip, and methods of drying. Of various oily substances tested, mineral oil and olive oil appeared to be the most satisfactory for improving the keeping quality and color. Dehydrators suitable for prunes are thought to give satisfactory results in grape drying, but to require greater heat and air supply. Finishing temperatures not exceeding 165° F. are considered safe, with a relative humidity at the finishing temperature of about 25 per cent.

Cost estimates are given for drying the grapes entirely in the dehydrator and partly in the dehydrator and in the sun. The combined process, which results in improvement in color, does not add appreciably to the cost.

Color of potato chips as influenced by storage temperatures of the tubers and other factors, M. D. SWEETMAN (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 6, pp. 479–490*).—Inquiries received at the Maine Experiment Station concerning the cause of dark color in potato chips prepared in the winter from nothern-grown potatoes led to this investigation of the effect of various factors on the color of the chips. The factors studied included variety, maturity, disease, and time and condition of storage of the potatoes. A uniform frying technic was followed in testing all of the samples, and the colors of the chips were determined by first selecting eight chips of varying color and measuring their color qualities according to the Munsell notation as described by Nickerson (E. S. R., 62, p. 503). Each chip was then compared with the color scale thus developed.

The varieties tested included Bliss Triumph, Irish Cobbler, and Green Mountain. The first two varieties were grown at Aroostook Farm in the northeastern part of the State and the Green Mountain at this farm and also at Highmoor Farm in the south-central part. Differences between the frying color of the three varieties were not as great as differences in potatoes from the single variety grown at the different farms. The size of the potato was apparently without effect upon the color of the chips provided the potatoes were of the same maturity. Immature potatoes gave chips of darker color than the mature. In a few cases disease affected the rate of change of frying color, but no definite conclusion could be drawn concerning this. Samples held in commercial cold storage two weeks or more produced chips of a very much darker color than those made from potatoes of the same lot at the beginning of the experiment or held in storage at from 40 to 55° F. Potatoes held at from temperature for some time after storage at lower temperatures produced lighter chips than when taken from cold storage.

All of the differences noted could be correlated with variations in sugar content, the higher the sugar content the darker the color. Even freshly gathered northern-grown potatoes may be somewhat immature and consequently have a high sugar content. This is thought to explain the differences in the color of the chips from the same variety grown at the two farms. Since trade preferences show that very light chips are desired, it is concluded that northern-grown potatoes may be unsuitable for this purpose when brought in from the field.

Cooking quality of potatoes (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 35, 36*).—Five different lots of potatoes of the same strain but grown under different soil conditions were baked, boiled, and steamed and tested for mealiness, whiteness, and flavor, mealiness being determined by appearance, breaking with a fork, and feel on the tongue. Lot 5, grown on soil that had had a sod cover crop and manure, ranked first in mealiness, whiteness, and flavor; lot 3, grown on manured land, ranked last; with lot 1, grown on bottom land highly manured and fertilized, scoring almost as low. Chemical analyses showed that lot 5 had the highest value and lot 3 the lowest in total solids. In sugar content lot 3 was very low and lot 5 intermediate. In ash value lot 3 ranked highest. "Some correlation may be seen between cooking qualities and sugar content, but until a better standard is found for judging mealiness, whiteness, and flavor, it would be inadvisable to attempt to show further correlations."

Development and use of baking powder and baking chemicals, L. H. BAILEY (*U. S. Dept. Agr. Circ. 138* (*1930*), *pp. 16*).—This circular includes a

historical sketch of the evolution of baking powder from the early leavening agents of the Egyptians to the present combination powders, a discussion of the chemical composition and probable reactions of the various types of baking powders now in use, and descriptions of the methods of analysis of baking powders and of methods of preparing baking chemicals.

A list of 15 references to the literature is appended.

A decade of progress in nutrition, E. V. McCollum (*Ann. Amer. Acad. Polit. and Social Sci., 151 (1930), Sept., pp. 82–91*).—In this comprehensive review of the more important discoveries in nutrition research in the past 10 years, the principal topics discussed include rickets and vitamin D, the nature of vitamin A, the relationship of vitamins A and E to fertility, vitamin G to pellagra, and vitamins C and D to the teeth, diet in relation to anemias, goiterogenic diets, dietary studies of milks, and the deficiency of mineral elements in pastures. In conclusion the author states his belief that, while in no field of human advancement has progress been more rapid than in the nutritional field, "the researches which have placed us in such an advantageous position in the effective utilization of our food resources have, however, brought to light some very serious problems with respect to animal production. No other nation is now squandering its natural resources in soil fertility so fast as the United States. We shall need wise statesmanship to prevent us from drifting rapidly into a most serious situation as a result of soil erosion, exhaustion of pasture lands, and waste of fertilizing elements through short-sighted systems of sewage disposal."

Fat metabolism.—I, A study of the rate of digestion of fats as determined by the chylomicrons of the blood, E. H. MacArthur (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 299–306, figs. 3*).—This paper is a more complete report, with experimental data, of an investigation noted previously from a preliminary report from the New York Cornell Experiment Station (E. S. R., 62, p. 788).

In the tests on human subjects, the test meal was taken in the morning after a fasting period of from 12 to 15 hours and a drop of blood taken from the tip of the finger every hour during the digestive cycle for 7 or 8 hours. In the rats the blood was taken from the tip of the tail. In calculating the rate and time of complete digestion of fat from the chylomicron counts, curves were plotted with the counts as ordinates and the hours at which the counts were made as abscissas. The areas inclosed by the curves were then calculated by using the trapezoidal rule and finding the mean ordinates, the formula being

$$\frac{\frac{\text{First}+\text{last}}{2}+\text{intermediate}}{n-1}$$

where n=the number of cases.

A comparison of the results obtained in this way with those obtained by the use of the planimeter indicated that the former had as high a degree of accuracy as the latter. Areas as thus determined from the data obtained on human subjects for the different test meals were as follows: 20 gm. butter from cow's milk 39.2 sq. cm., 17 gm. cod-liver oil 36.9, 20 gm. butter from goat's milk 33.0, 30 gm. fat and bran 31.0, and fat-free meal (boiled rice and jam) 15.5 sq. cm.

The relative vitamin A value of the body and liver oils of certain fish, B. Ahmad and J. C. Drummond (*Biochem. Jour., 24 (1930), No. 1, pp. 27–36, figs. 6*).—The experiments reported were undertaken to examine the claims of Schmidt-Nielsen (E. S. R., 63, p. 92) that there is no strict relation between

the color and biological reactions for vitamin A and that the blue color reaction is probably due to substances which accompany the vitamin.

Six samples of fish-body and fish-liver oils, including two supplied by Schmidt-Nielsen, were examined both colorimetrically and biologically, with results thought to be in satisfactory agreement. The three body oils of herring and salmon and the liver oil of the basking shark neither gave a positive colorimetric test nor showed activity in the biological tests. In comparison with an average sample of cod-liver oil, inducing normal growth as the source of vitamin A in doses of from 2 to 4 mg. daily and having a colorimetric value of 10 blue units in 10 per cent dilution, the sample of herring-liver oil with 11.2 blue units was biologically active in doses of 2 mg. daily and the salmon-liver oil with 59 blue units was active in 0.3 mg. doses.

In comparison with the values reported by Schmidt-Nielsen, the present values agree more closely in the colorimetric than in the biological tests. "The disagreement between Schmidt-Nielsen's results and ours is due possibly to differences of technic, and to his attempting to express the results of the biological test, which is liable to wide variations, in terms of the units proposed by the United States Pharmacopoeia. This is especially liable to lead to erroneous results when oils of low vitamin A content are examined."

The influence of fertilizer treatment on the vitamin A content of spinach, H. E. HONEYWELL and R. A. DUTCHER (*Pennsylvania Sta. Bul. 258 (1930), p. 8*).—Spring and fall spinach grown under various types of fertilizer treatment at the Rhode Island Experiment Station, dried under controlled conditions, stored under CO_2, and shipped to the station, is being tested for vitamin A. Thus far it has been found that chlorotic spinach grown on soils with deficient manganese fertilization contains less vitamin A than normal spinach, and that the greater the chlorotic condition the lower the content of vitamin A.

Vitamin B content of kale and mustard greens (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 33–35*).—The relative amounts of vitamins B (F) and G in kale and mustard greens were determined, using autoclaved yeast and wheat as the standard sources of vitamins G and B, respectively. It was found that 2 gm. of fresh kale daily was necessary to protect rats against beriberi when vitamin G was supplied by 0.4 gm. of autoclaved yeast, but that 0.75 gm. was sufficient to maintain weight when vitamin B was supplied by 0.4 gm. of wheat. Fresh mustard greens appeared to have a slightly higher content of vitamin B than fresh kale and about the same amount of G as kale. In vitamin B determinations with cooked and canned greens, 3.5 gm. of cooked kale, 3 of canned kale, 3 of cooked mustard greens and 2.75 gm. of canned mustard greens were required to protect against beriberi. The data thus show a higher content of vitamin G than B in both kale and mustard greens and greater destruction of vitamin B in the cooked than in the canned material.

Further evidence for a third accessory "B" factor, V. READER (*Biochem. Jour., 24 (1930), No. 1, pp. 77–80, figs. 2*).—The additional evidence for the existence of a third vitamin B factor labile to heat and alkali (E. S. R., 62, p. 589) is based on rat-feeding experiments on a basal vitamin B-free diet supplemented by known sources of vitamins B_1 and B_2 alone or with the addition of a concentrate of the newly identified substance. The B_1 concentrate was prepared by the Kinnersley-Peters method (E. S. R., 60, p. 94) and given in amounts of three pigeon day doses, or approximately 1 mg., daily. The concentrate of vitamin B_2 was yeast extract heated at 120° C. for one hour at pH 9 and neutralized. The vitamin B_3 concentrate was obtained from the mercuric sulfate precipitate in the Kinnersley-Peters method of concentrating vitamin B_1, from which it was possible to recover 75 per cent of the vitamin B_3 of the original extract.

Two types of experiment were carried out. In the first rats were brought to constant weight on the basal diet plus vitamin B_2, growth usually ceasing at the end of 2 or 3 weeks. The vitamin B_1 preparation was then given daily. This brought about a temporary response for another 2 or 3 weeks, after which no further response could be obtained by doubling either B_1 or B_2 or both. The extract of vitamin B_3 was then given daily by mouth, and this was followed by prompt renewal of growth.

In the second series of experiments the rats were brought to constant weight on the basal diet alone, and then the vitamin B_1 and B_2 preparations were given in quantities proved sufficient in the first series of experiments. No growth resulted even when the dosages of both were doubled, but on adding the unit quantity of vitamin B_3 normal growth was immediately resumed.

The experimental data reported also bring out the fact that at the beginning of the experiment the storage period for vitamin B_3 was approximately 5 weeks while that for vitamin B_2 was about 3 weeks, and that when the store of vitamin B_3 had been exhausted and daily doses were given, an omission of vitamin B_3 stopped growth at the end of 1 week.

Studies on experimental rickets.—II, The influence of ultra-violet irradiation on the antirachitic value of soybean oil, S. Izume, Y. Yoshimatsu, and I. Komatsubara (*Jour. Biochem., 10 (1928), No. 1, pp. 177–182*).—In this continuation of the investigation noted previously (E. S. R., 60, p. 197), samples of crude and refined soybean oil obtained by hydraulic pressure and by benzine and alcohol extraction were tested for vitamin D by feeding experiments on young rats rendered rachitic on the Steenbock diet 2965. The diagnosis of healing effect of the test materials was made on the basis of radiographs taken before and after the experimental period and by histological examination of the distal ends of the tibia.

The crude oil produced by means of the hydraulic press was the highest and the oil obtained by extraction with alcohol the lowest in antirachitic value. No destruction of vitamin D apparently took place in the refining process. Irradiation of the oils resulted in a significant increase in their antirachritic potency.

Phytosterol obtained from crude soybean oil exhibited the well marked absorption bands of ergosterol, the intensity of which at a dilution of 1 : 50 was nearly equivalent to that of ergosterol at a dilution of 1:20,000.

Anti-rachitic value of egg yolks (*Kentucky Sta. Rpt. 1929, pt. 1, p. 32*).—The yolks of eggs produced in the spring and stored until fall and winter were found to have a higher content of vitamin D than that of yolks of eggs produced in the fall and winter under like conditions.

TEXTILES AND CLOTHING

Wool: A study of the fibre, S. G. Barker (*[Gt. Brit.] Empire Marketing Bd. [Pub.] 21 (1929), pp. 166, pl. 1, figs. 25*).—A résumé of recent information and research on the history, biology, chemistry, physical and dimensional characteristics, and microbiology of wool is presented, with a bibliography of nearly 200 references.

The influence of laundering and exposure to light upon some washable silks, M. Griffith (*Ohio Sta. Bimo. Bul. 147 (1930), pp. 179–181*).—When subjected to laundering, light exposure, and standard textile tests, a very decided fading was found to take place in washable silks on exposure to light and during laundering, various colors in the different brands showing similar results as to fading. Blue and green faded most in both laundering and exposure to light, violet faded very much with the light but was affected only

slightly in laundering, whereas peach and yellow were only slightly affected by either laundering or light.

There was a greater but more variable decrease in the strength of the silks due to exposure to light than due to the laundering process. After 48 hours of exposure to light the breaking strength ranged from 31 to 69 per cent of that of the new fabrics. The decrease in strength after 15 launderings ranged from 15 to 17 per cent. The silks lost from 25 to 42 per cent in elasticity with 48 hours exposure to light.

The higher priced silks were found to be of better construction, a characteristic accompanied by the highest breaking and bursting strength. All of the pure dye silks showed some weighting; the most weighting was found in the lowest priced silk and the least in the highest priced fabric, the latter containing less than one-third the quantity of finishing materials found in the cheapest silk.

Heat transmission through blankets, M. F. Weinrich (*Science, 71 (1930), No. 1842, pp. 421, 422, figs. 2*).—A description, with diagram, is given of an apparatus devised to determine the heat-retaining properties of blankets. The apparatus consists essentially of a covered copper vessel 12 by 12 by 3.5 in. provided with immersion heaters, thermometers, and stirrers. The vessel is filled with water and covered with a closely fitting bag made of the material to be tested. In operation it is placed in the food compartment of an electric refrigerator provided with a temperature recording device. By means of the heating device the temperature inside the flask is kept at 37° C. (98.6° F.). From readings of the variations of the temperature in the refrigerator, the energy supplied in heating the water, and the resulting temperature, it is possible to measure the heat insulating properties of the blanket. In order to have values which are numerically greater for the best insulation, comparisons may be made of the water needed when the body is covered with only a cotton sheet and with the blanket being tested and the values expressed as the differences between these measurements.

HOME MANAGEMENT AND EQUIPMENT

A study of kerosene cook stoves, E. B. Snyder (*Nebraska Sta. Research Bul. 48 (1930), pp. 44, figs. 6*).—The results of studies of the advantages and disadvantages of 10 kerosene stoves having four types of burners are reported. These included 4 stoves having long-chimney wick burners, 3 stoves having short-chimney wick burners, 2 stoves having short chimneys with asbestos kindlers or lighting rings, and 1 stove having wickless burners.

To determine comparative speed of burners, equal quantities of water were heated through equal ranges of temperature. The tests were made by two methods, the "cold start," in which the time required to heat the water after the lighting of the cold burner was determined, and the "hot start," in which the time was determined with the burner fully heated at the beginning of the test. By the cold start method the average time required to heat the water by all long-chimney wick burners, adjusted as directed for maximum heat, was significantly less than averages for other types. The time required by one short-chimney burner studied was less than that of one long-chimney burner. The wickless burner required the longest to heat of the four types. By the hot start method the average time required to heat the water was approximately equal for burners with wicks. The average time required by burners with lighting rings and by wickless burners was greater than by those with wicks. The wickless required the longest time. Some differences in speed of

heating of individual burners of the same type were greater than the average differences for groups of different types. Giant burners required less time to heat the water than standard burners on the same stove. Burners covered with heavy grates required a longer time to heat the water than burners covered by open grates. Burners with wicks cooled more rapidly than other types. The wickless burners held heat longest.

To determine the comparative thermal efficiency of burners, equal amounts of water, at the same initial temperature, were completely evaporated, and the amount of kerosene used was determined. The average thermal efficiency of all long-chimney wick burners was lower than that of burners of other types. The average thermal efficiency of short-chimney wick burners was highest of the four types. One burner of the short-chimney lighting-ring type was higher in thermal efficiency than the average for short chimneys with wicks. The wickless burner was higher in thermal efficiency than long-chimney burners, but lower than the two remaining types. Standard burners were higher in thermal efficiency than giant burners on the same stove.

Long-chimney burners adjusted as directed by the manufacturer for maximum heat, that is, with yellow tips 1.5 in. above the blue flame, did not form soot on utensils. Other types of burners formed soot frequently. Because of the contact of the flame with the utensil, these burners are more likely to be affected by outside factors, causing soot to be formed.

To learn the effect of the size of utensil on the performance of burners, water was heated through equal ranges of temperature in pans of equal depth but varying in diameter. Giant and standard burners on the same stove were used for the tests. As the diameter of the pan increased the thermal efficiency increased, reaching a maximum at the largest pans, and as the diameter of the pan increased the time per pound required to heat it through a given range of temperature decreased, reaching a minimum at the largest pans. The practical significance of these results is that for every burner there is a definite size of utensil which can be used to best advantage. From the standpoint of economy of time and fuel, utensils should in general be fairly large.

To determine comparative cost of operation and time used for the cooking of food with different types of burners, a week's menus for six persons were cooked on four selected stoves, representing the different burner types. The burners were operated so as to use the minimum amount of time and oil. The long-chimney burner, over a week's time, used the greatest amount of kerosene. The short-chimney wick burner used the least kerosene of the four types. The total cost of operation, including wicks, lighting rings, and gasoline for priming the wickless burner, was highest for the long-chimney wick burner. For the wickless burner the total cost was slightly less than for the long-chimney wick burner. The total costs for the short-chimney with wick and the lighting-ring burners were lowest and approximately equal. The time required in burner hours was approximately equal for the long-chimney wick burner and the burner with lighting ring. The time required by the wickless burner was greatest of the four types. The burners with wicks were more quickly and easily adjusted for varying degrees of temperature for cooking purposes than were the other types of burners.

Selection and management of kerosene cook stoves, E. B. Snyder (*Nebraska Sta. Circ. 41 (1930), pp. 14, figs. 4*).—Practical information is given in this circular regarding the advantages and disadvantages of the various types of kerosene cook stoves on the market. The types discussed are the long-chimney wick, short-chimney wick, short-chimney lighting-ring, and wickless stoves.

MISCELLANEOUS

Thirty-ninth Annual Report [of Alabama Station, 1928], M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1928, pp. 27*).—This contains the organization list and a report on the work and publications of the station for the fiscal year ended June 30, 1928. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Report of Moses Fell Annex Farm, Bedford, Indiana, June, 1930, H. J. REED and H. G. HALL (*Indiana Sta. Circ. 172 (1930), pp. 24, figs. 17*.—The experimental work summarized in this report is for the most part abstracted elsewhere in this issue.

Forty-second Annual Report of [Kentucky Station], 1929, I, T. P. COOPER (*Kentucky Sta. Rpt. 1929, pt. 1, pp. 55*).—Part 1 of this report contains the organization list, a financial statement as to the Federal funds for the fiscal year ended June 30, 1929, a report of the director on the work and publications of the year, and meteorological data. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 353 (1929), pp. [2]+141–156+XIII*).—This contains the organization list of the station; abstracts of 10 papers, 8 of which are noted elsewhere in this issue and 2 previously (E. S. R., 61, p. 254; 62, p. 246); meteorological observations, noted on page 116; a financial statement for the fiscal year ended June 30, 1929; an index to Bulletins 350–353, inclusive, which collectively constitute the forty-fifth annual report of the station; and announcements as to the work and publications of the station.

***Forty-third Annual Report of the Pennsylvania Agricultural Experiment* Station, [1930]**, [R. L. WATTS ET AL.] (*Pennsylvania Sta. Bul. 258 (1930), pp. 52, figs. 14*).—This bulletin discusses briefly the work of the station for the fiscal year ended June 30, 1930, including a financial statement for this period. The experimental work recorded and not previously noted is for the most part abstracted elsewhere in this issue.

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [November-December, 1930] (*Ohio Sta. Bimo. Bul. 147 (1930), pp. 177–208, figs. 6*).—In addition to seven articles abstracted elsewhere in this issue, this number contains Commercial Feeds Sold in Ohio, by V. R. Wertz (pp. 198, 199).

NOTES

Georgia Station.—R. G. Pridmore has been appointed assistant agronomist, and will work in cooperation with the Superphosphate Institute of Washington, D. C., in determining the value as a fertilizer material of superphosphate treated with anhydrous ammonia.

Kansas College and Station.—Albert Dickens, associated with the horticultural department since 1899 and professor of horticulture since 1902, died November 28, 1930, after a long illness. Born at Anoka, Minn., in 1867, he was a graduate of the college in 1893 and had been an influential factor on its campus for many years. In the words of a recent tribute by President F. D. Farrell, "he was one of those rare professional men whose interests transcend their professions. By profession he was a horticulturist and forester, but he was interested in virtually everything: Government, cattle, horses, motor cars, poetry, fiction, history, religion, morals, finance, architecture, art, education, geology, mythology, and his interest was informed and intelligent. He loved trees and flowers and the songs of birds. His knowledge of these and of scores of other things was amazing. . . . The college never had a more valuable faculty member."

Massachusetts College.—A $1,200 fellowship has been given the college by cranberry interests for studies of the nutritive value, storage, and preservation of cranberries and canned cranberry sauce.

Dr. Walter S. Eisenmenger has been appointed research professor in agronomy vice Dr. J. P. Jones, whose resignation has been previously noted. Dr. Eisenmenger's work will deal very largely with investigations in genetics and plant physiology as these pertain to the highly specialized agriculture of the Connecticut Valley.

Michigan College and Station.—Dr. M. M. McCool, head of the department of soils, has accepted a position with the Boyce Thompson Institute.

Montana College and Station.—Dr. A. L. Strand, assistant professor of entomology and assistant entomologist in the University of Minnesota and station, has been appointed head of the department of entomology of the college and station beginning April 1. R. A. Cooley, who has continued to serve temporarily as head of this department since his resignation, will continue his connection with the college on a part-time basis, devoting the remainder of his time to the work of the State board of entomology.

Dr. R. E. Wall has been appointed assistant entomologist of the station beginning January 1, vice Dr. W. C. Cook, resigned.

Cornell University.—Anna Botsford Comstock, emeritus professor of nature study since 1922, who died August 24, 1930, at the age of 76 years, was notably successful as a pioneer in promoting the introduction of nature study into the public schools. She was also widely known as a prolific writer of nature study books and articles and for her proficiency in wood engraving, which she took up as an aid to the work of her husband, Dr. J. H. Comstock. A graduate of the university in 1878, she became associated with the instruction staff of the College of Agriculture in 1899 and was made professor of nature study in 1920.

South Dakota College and Station.—Wilbur C. Tully, extension poultryman of the North Dakota College, has been appointed chief of the poultry department.

EXPERIMENT STATION RECORD

VOL. 64 FEBRUARY ABSTRACT NUMBER No. 3

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The chemistry of the colloidal state, J. C. WARE (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. XIV+313, pl. 1, figs. 96*).—This is a textbook of which the purpose is "to present the fundamentals of colloid chemistry as they are disclosed by an analysis of the material available at this time. . . . The theoretical portions involve the most generally accepted interpretations of modern colloid chemists. The subject matter is presented with numerous journal references so that the student will be encouraged to do further reading and research. In presenting the standard theorems and equations, the analytical method is followed in order that the various viewpoints of the topic can be gained as well as in order to encourage the student to reason out the relationships for himself."

The contents are as follows: The units of a colloidal solution; sedimentation; interfacial phenomena (nonelectrical); turbidity and colloidal suspensions; colloidal suspensions and color; motion in colloidal suspensions; the electrical character of interfacial phenomena; the preparation of substances in the colloidal state; the precipitation of substances in the colloidal state—stabilization or protection of the colloidal state; water in combination—viscosity and plasticity of colloidal suspensions; emulsions; gels; silica gel and its use in adsorption; and catalysis by contact agents.

An introduction to surface chemistry, E. K. RIDEAL (*Cambridge, Eng.: Univ. Press, 1930, 2. ed., rev., pp. XI+459, figs. 62*).—The author notes that "in this second edition an attempt has been made to revise and review our present knowledge of the properties of interfacial phases, but, as in the first edition [E. S. R., 56, p. 501], to keep the volume within reasonable dimensions, the general properties of disperse systems have not been elaborated in any detail."

An etymological dictionary of chemistry and mineralogy, D. and K. C. BAILEY (*London: Edward Arnold & Co., 1929, pp. VIII+308*).—This work "provides . . . the derivation of chemical and mineralogical names which have been current in the literature of these subjects at any period later than the middle of the nineteenth century." It is noted, further, that "with the exception of a few of the more important, such as aspirin, trade names have been omitted, as they are generally arbitrarily derived and frequently of only passing interest. Rock names have not been included. Although the work is not as complete with respect to terms as to names, a large number of terms has been added."

Reactions and symbols of carbon compounds, T. C. TAYLOR (*New York and London: Century Co., 1930, pp. X+704, figs. 5*).—"In this book an attempt is made to develop the subject on the basis of experimental experience. The use of symbols, the description of methods of ultimate analysis, the determination of molecular weights, and the various schemes of classification are left until necessity justifies their introduction. . . . "In the main, an attempt is made to help the student help himself by showing him how a set of experimental data may be interpreted in the light of current chemical concepts."

The contents are as follows: Introduction—paraffin hydrocarbons; unsaturation—olefine and acetylene hydrocarbons; polymethylene and cycloparaffins; alcohols; aldehydes and ketones; carboxylic acids; a review of general reactions; fats and waxes; nitrogen derivatives of carbon compounds; acid amides; discussion of relative basicity of carbon compounds of nonmetallic elements; sulfur derivatives of the aliphatic compounds; the metallic compounds of carbon; the properties of mixed types; anhydrides of the glycols; oxidation products of the various glycols; dibasic acids; stereochemical configuration; optical activity and optical isomerism; the carbohydrates; complex polysaccharides—sugar derivatives; proteins; some nonprotein nitrogenous substances; benzenoid hydrocarbons and their derivatives—general discussion; methods for making benzene derivatives; reaction properties of benzenoid compounds as a function of their constituent parts; benzene and benzenoid compounds as individuals—classification and extension; the action of nitrous acid on the benzenoid primary amines and the properties of the diazo compounds and azo compounds; reactions involving rearrangements; quinones; naphthalene and its derivatives; anthracene; other complex hydrocarbons; terpenes; heterocyclic compounds; colored compounds and dyes; alkaloids; and drugs and antiseptics.

Contributions to the chemistry of the plant cell wall, III, IV, W. M. HARLOW (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 26 (1928), pp. 22, pls. 4*).—The two closely related investigations here reported as parts of a series of which parts 1 and 2 have already been noted (E. S. R., 61, p. 815), indicated the need for revision in the current interpretation of the chemical significance of staining tests, and of microchemical tests made under certain conditions, as follows:

III. The reliability of staining reagents in microchemical studies of plant cell walls.—Some of the stains most generally used for differential staining in plant histology were studied with respect to the purely chemical specificity of their action in coloring purified wood cellulose, purified lignin (prepared by treating alcohol-benzol extracted, thin transverse sections of *Catalpa speciosa* with 72 per cent of sulfuric acid, washing, and removing for staining "portions of the lignified middle lamella"), the middle lamella in the cambium region in chestnut twig sections, etc. The stains used included gentian violet, safranine, basic fuchsin, Bismarck brown, nigrosine, Magdala red, Congo red, malachite green, acid fuchsin, neutral red, Janus green, ruthenium red, hematoxylin, and methylene blue. From this part of the work it was concluded that "in general, staining reagents are unreliable as specific indicators of pectin, cellulose, and lignin in the cell walls of wood. The stains in common use in botanical work do not indicate the important changes in the chemistry of the middle lamella following its origin in the cambium.

"The objections offered to staining tests do not in any way detract from their usefulness in general histological research."

IV. *Some microchemical reactions of woody tissues previously treated with hydrofluoric acid.*—These results indicated that the lignin of wood sections

immersed for from one to four weeks in 48 per cent of hydrofluoric acid may be so altered chemically as to give much modified indices in microchemical tests normally resulting in the development of characteristic colors. The softening by hydrofluoric acid of wood too hard for sectioning appeared not to be due to desilicification alone or even largely. "The softening of woody tissues with hydrofluoric acid is probably accompanied by fundamental changes in the chemical nature of the cell wall.

"In microchemical analyses of plant cell walls, prior treatment with hydrofluoric acid should be avoided since treated material no longer represents the normal condition."

The nature of the Gram compound and its bearing on the mechanism of staining, A. E. and E. W. Stearn (*Jour. Bact., 20 (1930), No. 4, pp. 287–295*).—Absorption spectra indicated the presence of free iodine and free dye only in solutions of the methyl violet-iodine precipitate either in alcohol or in acetone; and the boiling point elevation produced by the dye-iodine precipitate when dissolved in acetone indicated complete dissociation in this solvent into free dye and free iodine. The authors of this contribution from the University of Missouri therefore reject the cell wall theory of the Gram staining reaction, since this theory "in its ordinary form necessitates the existence in the decolorizer solution of large dye-mordant molecules."

Enzymes, J. B. S. Haldane (*London and New York: Longmans, Green & Co., 1930, pp. VII+235, figs. 35.*)—This monograph "lays no claim to completeness," even in the purely chemical field to which alone the treatment is limited. It contains the following chapters: Introduction; the influence of enzyme concentration and hydrogen ion concentration; the union of the enzyme with its substrate and related compounds; the influence of temperature and radiation on enzyme action; the course of enzymatic reactions and its mathematical theory; specificity; coenzymes, activators, kinases, and complements; the poisoning of enzymes; the purification and chemical nature of enzymes; and theories of enzyme action and classification of enzymes.

Determination of carbonates in soil, C. J. Schollenberger (*Soil Sci., 30 (1930), No. 4, pp. 307–324, fig. 1*).—The author of this contribution from the Ohio Experiment Station notes the time-consuming character of most of the methods not admittedly inaccurate and the complexity and special construction of the glass apparatus usually required, presents a concise review of previous work on the determination of carbon dioxide in soils, and describes and illustrates an apparatus and method, requiring few if any pieces not generally available, for the carrying out of a determination based on the barium hydroxide absorption and titration principle.

Further, "a study of the reasons for high results in the determination of carbonates in soil is reported. It is shown that oxidation of organic matter to carbon dioxide by reaction with manganese dioxide native to the soil and added acid may be a factor that is in many cases important even with the most dilute acid at room temperature. The addition of ferrous chloride to the acid used for decomposing soil carbonates is proposed as a remedy for this source of error. As ferrous chloride does not entirely prevent evolution of carbon dioxide from soils containing no carbonates when treated with comparatively strong acid at higher temperature or for a longer time, the importance of conducting the determination at the lowest temperature and with the most dilute acid that can be used, consistent with complete decomposition of carbonates in a reasonable time, is stressed."

Investigations on soil organic matter; its determination and its importance as nitrogen reserve [trans. title], Vincent, HervIaux, and Gaudin

(*Ann. Sci. Agron. Franç. et Étrang., 47 (1930), No. 5, pp. 654–671*).—Humic substances extracted from the soil by alkaline solutions were found to vary in quantity with the chemical nature, concentration, and temperature of the extracting solution and with the time allowed for reaction; and the composition of the humus extracted was shown to vary with the concentration of the alkaline solution used. The experimental method consisted in the treatment of 5-gm. samples of the decalcified soil with 100 cc. of the extractant solution (of sodium or of ammonium hydroxide) on a water bath at 50° C. for from 1 to 2 hours, provision being made for the condensation of the small quantity of vapor evolved, while loss of weight was checked and corrected. The filtered humus solution was titrated with decinormal potassium permanganate.

By reason of the variations in result above noted, it is considered that definite conditions for the analysis must be imposed. Since, however, the humus precipitable by acidification and the soluble humic substances were found to reduce the permanganate in nearly constant proportions, different for each, it is concluded that the two fractions of the extract can be determined by the method suggested with an accuracy sufficient for ordinary purposes.

Studies on oxidation-reduction in milk: The methylene blue reduction test, H. R. THORNTON and E. G. HASTINGS (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 221–245, fig. 1*).—The mechanism of the reduction of methylene blue in milk, oxygen relationships, the effect of temperature, the sweeping effect of rising butterfat (considered at some length), the use of a measuring dipper, the sterility of dipper and dye solution, and the plate count and reduction time are discussed in a contribution from the Wisconsin and North Dakota experiment stations. The conclusions are stated in part as follows:

"The work reported in this paper tends to confirm the theory of Barthel that the disappearance of methylene blue in milk takes place in two stages, viz: (1) the removal of the dissolved oxygen by bacteria [and] (2) the reduction of the dye by constituents of the milk. The time taken for the first stage may be long. The time taken for the second stage is usually short.

"The oxygen relationship is of great importance. We were unable to find that a preliminary shaking of the milk materially affects reduction times. Evidence is presented that milks produced normally are in approximate oxygen equilibrium with the atmosphere.

"In milks to which this test is applicable, the variations in pH are insufficient to cause a measurable difference in reduction times. The importance of the rôle played by the leucocytes is not known. . . .

"It is probable that the two most important sources of inaccuracy are (1) the different rates of oxygen uptake of different species of bacteria, [and] (2) the sweeping of bacteria out of the body of the milk by the rising butterfat during the operation of the test. It is probable that the inaccuracies in this test follow the growth curve of the bacteria. Therefore, we do not consider the test reasonably accurate after the 5½-hour period as laid down in 'Standard Methods of Milk Analysis.' . . . A 10-cc. dipper is . . . sufficiently accurate for use in measuring samples for this test. It is sufficient that this dipper be thoroughly rinsed in the incoming milk or in water between each sample, if times are not to be read after the 5½-hour period. The use of any water fit for drinking purposes is warranted as the solvent for the dye.

"The methylene blue reduction test is as accurate a measure of the keeping quality of milk as any method yet available . . . Methylene blue reduction times should not be reported in terms of the plate count."

On the value of the antimony trichloride test for vitamin A, [I], II, S. and S. SCHMIDT-NIELSEN (*K. Norske Vidensk. Selsk, Forhandl., 1 (1926–1928),*

No. 29, pp. 77–80; 2 (1929), No. 13, pp. 44–47).—Essentially noted from another source (E. S. R., 63, p. 92).

Preservation of leather bookbindings, R. W. FREY and F. P. VEITCH (*U. S. Dept. Agr. Leaflet 69 (1930), pp. 8, figs. 3*).—This paper contains information, prepared by the Industrial Farm Products Division, Bureau of Chemistry and Soils, on the preparation and application of dressings for the preservation of leather bindings, the function of such dressings being the lubrication of the fibers of the leather to increase the flexibility and strength of the material, and the protection of the binding by the exclusion of destructive agencies. The recipes for dressings, of which seven are given, include two water emulsions containing sodium stearate, while another consists solely of purified petrolatum. In the case of bindings already badly weakened, varnishing with a pyroxylin lacquer from 24 to 48 hours after the application and polishing of the dressing is recommended. A formula for a lacquer considered suitable for such use is given.

METEOROLOGY

The present status of correlation investigation in meteorology [trans. title], F. BAUR (*Met. Ztschr. [Brunswick], 47 (1930), No. 2, pp. 42–52, figs. 5; abs. in Ztschr. Geophys., 5 (1929), pp. 391–399, figs. 2; U. S. Mo. Weather Rev., 58 (1930), No. 7, pp. 284–286, figs. 2*).—This article records preliminary attempts to apply "correlation reckoning to the phenomena of daily weather and related problems."

The author concludes that "the oscillations actually occurring in the several circulation systems and the weather anomalies connected with such oscillations can not be explained exclusively by oscillations in the general atmospheric circulation or by outside influences causing the same, and further that it is rather the peculiar laws inherent in the individual current systems and the relations existing between successive weather anomalies that are of deciding significance."

With regard to oscillations of the North Atlantic air circulation, he concludes that although the results of investigations relating to their conformity to law "have for the time being no direct value in long-range forecasting, since the weather depends not alone on the air pressure gradient from the Azores to Iceland, they mark a point of progress on the long, difficult road to long-range weather forecasting in that there are involved here the first relation equations that were obtained in strict adherence to theoretical considerations and calculations and which in the demonstrated stability and reality of each individual relation give a close connection between a meteorological value and a preceding complex of phenomena."

Monthly Weather Review, [July–August, 1930] (*U. S. Mo. Weather Rev., 58 (1930), Nos. 7, pp. 273–312, pls. 7, figs. 10; 8, pp. 313–349, pls. 15, figs. 4*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for July and August, 1930, solar and aerological observations, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 7.—Weekly Succession of Gulf Stream Temperatures in the Straits of Florida (illus.), by C. F. Brooks and E. M. Fitton (pp. 273–280); Reflectivity of Different Kinds of Surfaces, by H. H. Kimball and I. F. Hand (pp. 280–282); Rainfall Catch as Affected by Different Depths of Funnels in the Rain Gage, by B. C. Kadel (pp. 282, 283); The Present Status of Correlation Investigation in Meteorology (illus.), by F. Baur, trans. by W. W. Reed (pp. 284–286) (see above); An Inland Empire Long-Period Rainfall Riddle, by E. M.

Keyser (pp. 287, 288); Tulare Lake—A Contribution to Long-time Weather History (illus.), by C. E. Grunsky (pp. 288–290); Climate of Liberia (illus.), by H. J. Coolidge (pp. 291, 292); and Weather Abnormalities in the United States (Eighth Note): High Temperature in July, 1930, by A. J. Henry (pp. 293, 294).

No. 8.—Meeting of the International Geodetic and Geophysical Union Held in Stockholm, Sweden, August 15–23, 1930, by H. H. Kimball (pp. 313–316); Climatic Conditions in the Louisiana Purchase as Found by Lewis and Clark in 1804 and 1805, by G. K. Greening (pp. 317–319); Mud Floods in Utah (illus.), by J. C. Alter (pp. 319–321); Climatic Cycles (illus.), by A. W. Giles (pp. 321–323); Tornado at Vernon, Calif., March 15, 1930 (illus.), by M. E. Dice (pp. 324, 325); The Hardtner (Kans.) Tornado of June 2, 1929 (illus.), by I. B. Blackstock (p. 325); On the Frequency of Hurricanes in the Vicinity of Porto Rico, by O. L. Fassig (pp. 326, 327); Thunder and Lightning in the South Pacific Ocean (illus.), by A. Thomson (pp. 327–329); City Smoke and Heat Effects on Minimum Temperatures, by F. L. Disterdick (pp. 330, 331); and Thunderstorm Top Knots, by C. F. Brooks (pp. 331, 332).

Climatological data for the United States by sections, [July–August, 1930] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 17 (1930), Nos. 7, pp. [200], pls. 3, figs. 4; 8, pp. [200], pls. 2, figs. 8*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1930.

Meteorological tables, D. A. Seeley (*Mich. State Bd. Agr. Ann. Rpt. Sec., 67 (1928), pp. 63–75*).—Daily and monthly summaries of temperature, precipitation, cloudiness, and sunshine, and monthly summaries of pressure, wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos), at Lansing, Mich., are given for the year ended June 30, 1928. Mean temperature and total precipitation for each month since 1863 are also given.

SOILS—FERTILIZERS

The soils of Connecticut, M. F. Morgan (*Connecticut State Sta. Bul. 320 (1930), pp. 825–911, pl. 1, figs. 9*).—"The results of the investigations of the soils department of this station which contribute to a better understanding of the physical and chemical character of Connecticut soils with respect to their suitability for crop production, their natural nutrient deficiencies, and the responses of important crops to lime and fertilizer applications are brought together in this bulletin."

The topics taken up in the four parts into which the main subject is divided are (1) a descriptive inventory of Connecticut soils, (2) soil and land cover studies, (3) a critical study of the chemical composition of representative Connecticut soils, and (4) the nutrient requirements of Connecticut soils as measured by greenhouse and soil frame experiments, each section presenting the results of a detailed and thorough investigation by the soils department of the State experiment station.

"A 'key' is presented which shows the basis for classification of the soils of the State into soil series and types, depending upon color, texture, structure, and arrangement of the various horizons of the soil profile and their relationships to parent rock, mode of deposition of the parent soil material, topography, drainage conditions, and the occurrence of stones or bowlders. Such a classification enumerates 50 named soil series, comprising 176 types and phases. A detailed soil map of the State would picture at least this number of distinct soils."

The experimental outline of the chemical and the fertility estimation work is indicated, and a soil map of the State accompanies the bulletin.

Soil survey of Cameron County, Texas, M. W. Beck and B. H. Hendrickson (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1923, No. 17, pp. 537–575, pls. 5, fig. 1, map 1*).—This report has already been noted from the unnumbered edition (E. S. R., 57, p. 209).

The physical and chemical characteristics of certain American peat profiles, I. C. Feustel and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 214 (1930), pp. 27, figs. 2*).—Peats of which the points of origin were Orono and Cherryfield, Me., Beaufort, N. C., Monroe, Wash., and various sections of Florida were examined with respect to physical properties, chemical composition, bacterial activity, etc. Methods are described and the results are compared in tables and graphs.

The physical properties found most useful in differentiating the various forms of peat examined included principally the maximum moisture-holding capacity and the moisture equivalent, other properties differing less markedly. The chemical components of greatest differentiating value were the ether and alcohol extracts, the hemicellulose and cellulose content "lignin-humus complexes, soluble and insoluble nitrogen, and ash composition, including values for lime, alkalies, and sesquioxides in particular."

In general, "the sphagnum peats from Maine and, to a lesser degree, the sedge peat from Washington, are shown to be distinctly different from the other peats examined. In certain respects the sedge peat from Washington appears to be similar to the sphagnum peats, but in other properties it resembles the woody saw-grass or sedimentary peats from the South. Variations within profiles frequently tend to obscure differences between profiles. The somewhat wide range of physical and chemical properties between different strata within a deposit is due to varying successive types of vegetation and climatic factors involved in the transformation of vegetable matter to peat through microbiological activity. The data do not furnish evidence in support of any theory of lignite formation from present peat deposits. Peat is believed rather to consist of indefinitely preserved layers of plant remains once permanently submerged by water, and its degree of decomposition is indicated to some extent by the lignin-humus complexes."

The mechanism of buffer action in soils, P. B. Myers and G. M. Gilligan (*Delaware Sta. Bul. 166 (1930), pp. 37, figs. 14*).—Extending its earlier work, resulting in a method for determining the buffer capacity of soils (E. S. R., 60, p. 316), the station here reports further methodological developments, together with experimental results and conclusions in part as follows:

"The removal of dialyzable bases from the colloidal fraction of a soil by subjecting the material to electrodialysis results in the loss of its buffer capacity. The hydrogen-ion concentration of the colloidal material increases as the bases are progressively removed by electrodialysis. The hydrogen-ion concentration of the colloidal fraction of a soil is an index to the degree of saturation of the colloidal material with bases. The hydrogen-ion concentration of different soil types is not an index to their relative buffer capacities. When acid in excess of that required to unite with the replaceable bases of a soil colloid is added to a dispersion of soil colloidal material, the colloidal acid formed has no appreciable influence upon the ionization of the acid in excess and hence no appreciable influence upon the reaction of the resulting dispersion.

"The experimental evidence indicates that the mechanism of buffer action in soils is as follows: When acid is added to a soil it reacts with the salts of

colloidal acids forming colloidal acids and crystalloidal salts. The resultant reaction of the system is only slightly altered in consequence of the weakness of the colloidal acids. When acid is added in excess of that required to react with the cations of the colloidal salts, the crystalloidal salts formed, having an ion in common with the added acid, tend to repress the ionization of the latter. The net result is a small change in the hydrogen-ion concentration of the soil dispersion."

Full tabular data and 14 graphs present the numerical observations.

The indirect determination of various soil characteristics by the hydrometer method, G. J. BOUYOUCOS (*Soil Sci., 30 (1930), No. 4, pp. 267–272*).—The experimental results given in the present contribution from the Michigan Experiment Station indicated that the soil material determined by the hydrometer method at the end of 15 minutes and designated "total soil colloids," has a close relationship to the moisture equivalent of the soil and to its content of "unfree" water. "On account of this close relationship these physical characteristics of soils may be indirectly determined very quickly by the hydrometer method. It also appears that the wilting coefficient of soils also may be indirectly determined by the hydrometer method very rapidly. These various indirect determinations should be regarded only as approximately correct."

Rate of loss of replaceable potassium by leaching, O. C. MAGISTAD (*Soil Sci., 30 (1930), No. 4, pp. 243–256, figs. 4*).—Experiments on an artificially prepared potassium zeolite, and on soil leached with a slightly alkaline potassium chloride solution, then washed free from soluble chlorides, were made in this investigation of the Arizona Experiment Station. Data were obtained also with respect to the effect of calcium carbonate on the leaching of potassium, and the combined data were considered mathematically to determine the nature of the equation representing the rate of loss of potassium by leaching from the soil.

"Synthetic potassium zeolites were leached with distilled water and the successive portions of leachate analyzed for potassium. The data obtained could be expressed by means of an equation. . . . The constants in the leaching equation were fairly uniform for the noncalcareous soils. Those for the calcareous soils indicated a much lower rate of loss of potassium, whereas the constants for synthetic zeolites fell between that for calcareous and noncalcareous soils. Although the constants in the leaching equation for potassium for widely different soils vary considerably, it seems plausible that for a particular series a single set of constants would hold fairly well, and that the use of an equation containing these constants would enable one to estimate the rate of loss of potassium over periods of a few years."

Some carbon-nitrogen relations in soils, W. R. LEIGHTY and E. C. SHOREY (*Soil Sci., 30 (1930), No. 4, pp. 257–266*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils determined the carbon-nitrogen ratio in soils from Maine, New York, New Jersey, Colorado, and other representative points covering 12 States, 63 locations, and 176 individual samples, and showed "that the C:N ratio is quite variable, and, with a few exceptions, is highest in surface soil and becomes less at lower levels. It is suggested that some idea of the availability of the organic matter as food for microorganisms may be indicated by the C:N ratio in surface soils.

"The data show the futility of attempting to calculate the organic matter by multiplying the total N by the factor 20, as has been proposed."

The significance of the hydrogen-ion concentration in soil nitrification studies, H. HUMFELD and L. W. ERDMAN (*Iowa Acad. Sci. Proc., 34 (1927), pp. 63–67, fig. 1*).—A group of 19 plats of Carrington loam variously treated with respect to rotation, liming, and sources of organic matter, and ranging in pH

value from 5.16 to 7.18 was used in this investigation of the Iowa Experiment Station. Samples from each plat were moistened to 50 per cent of saturation, and determinations were made (1) of the nitrification of the soil nitrogen, (2) of the nitrification of ammonium sulfate added at the rate of 80 mg. to 100 gm. of the soil, and (3) of the same proportion of ammonium sulfate, when "210 mg. of calcium carbonate were added in order to determine the power of the soil to nitrify ammonium sulfate in the presence of the theoretical amount of calcium carbonate needed to neutralize the acids formed by the complete oxidation of the ammonium sulfate."

Nitrification went on under the conditions indicated until the pH value dropped to from 4.8 to 4.4, then became very slow. Little ammonium sulfate was nitrified below pH 4.2. When calcium carbonate was added nitrification was considerably increased, as a result, apparently, of the more favorable reaction obtaining in the soil throughout the period of incubation. The final reaction of the soils was somewhat more acid than the initial reaction, "which seems to indicate that a somewhat larger amount of calcium carbonate than the theoretical amount is necessary to completely neutralize the acidity produced. . . . There is also a very good correlation between treatments and nitrification. Manure plus lime gives the greatest increase in nitrification, closely followed by lime with crop residues and lime alone. Manure alone had no appreciable effect. The effect of rotation is also noticeable. Nitrification in the soil on the plats under continuous corn is considerably less than where three and five year rotations are practiced."

Local variation of soil acidity in relation to soybean inoculation, G. Z. Doolas (*Soil Sci., 30 (1930), No. 4, pp. 275–287, pls. 2, fig. 1*).—On growing soybeans in the greenhouse with the roots partly through soil zones showing various pH values, repressed nodulation and root injury were noted by the author of this communication from the Missouri Experiment Station in the root segments exposed to soils of pH 3.8 to 4.6. In contact with soil of pH 5.6 the root segments were healthy and usually uniform in nodulation.

"The paraffined screen pot permitted growing different portions of the same root in areas of different reactions within the same pot. Apparently healthy plants of uniform growth resulted when part of the root system was partially injured in the extremely acidic soil areas (pH 4.0 to 5.6), and partially healthy plants in the less acidic media (pH 5.6). When the entire root system was surrounded by the extremely acidic soil, however, abnormalities in the growth both of roots and tops were evident. It seems probable that depression of nodulation by acidity above the acid degree of pH 3.8 or 4.0 occurred through the action of the acidity on the plant tissue locally, or through the disturbance of the nutritive supply by the plant to the organism and tissue area in question. Nodule organisms retained their viability in all soil media with degrees of acidity ranging from pH 3.8 to 8.3."

Interrelation of nutrients and soil reaction on growth and inoculation of alfalfa, M. C. Sewell and P. L. Gainey (*Soil Sci., 30 (1930), No. 4, pp. 297–305, pls. 3*).—This brief contribution from the Kansas Experiment Station presents in conclusion the statement that "the limited data presented in this report indicate that the reaction of the soil, if within a range of pH 4.5 to 7.0, is a minor factor in affecting growth of alfalfa, all the needed nutrients being supplied; that the reaction may be a very important factor in symbiotic fixation, under conditions of limited nutrients; and that variation in nutrients with constant reactions causes great variation in the growth of alfalfa, which may be attributed in part to the effect of the nutrient on nodulation and fixation of nitrogen."

Seasonal variation in the number of two species of Rhizobium in soil, J. K. Wilson (*Soil Sci., 30 (1930), No. 4, pp. 289–296*).—This contribution from the New York Cornell Experiment Station reports results obtained in the examination of samples taken from 10 plats in 8 collections made during a period of about 8 months. Definite portions of the soils were used as inoculating material for sterilized soil held in glass tumblers. Seeds of *Trifolium pratense* and of *Vicia villosa* were planted after proper treatment to remove any adhering legume bacteria. The soils in the tumblers were kept suitable for plantlets by adding the necessary water, free of the legume bacteria. The containers holding the inoculated and plated soils were placed in the greenhouse, and favorable conditions were maintained for growth and nodulation. In about 15 days after planting, the plant roots were examined for nodules. The presence or absence of nodules resulting from a series of dilutions established the approximate number of legume bacteria to a gram of soil.

The number of Rhizobium organisms of each species studied showed a wide variation. In the soils of two of the plats the number of *R. trifolii* varied from approximately 100 per gram to as few as 1 in 5 gm. The number varied in the other 8 plats from 50 to 100,000 per gram. The number of *R. leguminosarum* varied in the soils of two of the plats from 1 in 50 gm. to 500 per gram, whereas in the other 8 plats there were more bacteria of this species. The variation was in one case from 50 to 5,000 per gram of soil and in another case 2,500 to 75,000.

Except in the two plats above noted there was a decided drop in the number of both species of Rhizobium in all plats as the winter season advanced. This drop did not always occur in the soils of the different plats at the same date. As the temperature increased in the spring and conditions became favorable for growth and multiplication, the bacteria of both species increased until they were in most cases as numerous in June as they were in October.

Soil fertility (*Michigan Sta. Rpt. 1928, pp. 219–221*).—Fertilizer and liming experiments for the most part of the usual type are here included. Ontonagon clay, extensive in the Upper Peninsula, responded markedly to mole drainage, fertilizer, and lime.

Coarsely ground limestone was compared with more readily available sources of soil lime. It was shown that if used for alfalfa the coarsely ground material should be applied the year before sowing the crop.

Mechanical analysis of finely divided natural phosphates, L. T. Alexander and K. D. Jacob (*U. S. Dept. Agr., Tech. Bul. 212 (1930), pp. 24, figs. 2*).—A method for separating 800-gm. samples of natural phosphate into particle size fractions corresponding to the sand, silt, and clay fractions of the mechanical analysis of soils is detailed, and its successful application "to all commercial types of natural phosphates except Tennessee blue rock" is reported. "In this method the fractions are separated by sedimentation in water without the use of any theoretical assumption, the progress and efficiency of the separation being checked solely by microscopical examination of the fractions. The specific gravities of the original samples and of the fractions of the various types of phosphate rock produced in the United States do not range sufficiently to preclude the use of an average specific gravity of 3 in calculating the settling velocities of phosphate particles by means of Stokes's formula."

It is further noted that "the pipette method, as developed for the mechanical analysis of soils in the soil-physics laboratory of the Bureau of Chemistry and Soils, was successfully applied to the analysis of finely divided natural phosphates. The magnitude of the error involved when samples of natural phosphates are pipetted at a constant time and depth without regard to temperature was determined. An experimental study of the settling velocities of 5μ phos-

phate particles at various temperatures showed that the rate of fall is considerably slower than the theoretical rate calculated by means of the customary form of Stokes' formula. This discrepancy is apparently due to the irregular shape of the phosphate particles. As applied to natural phosphates, the particle-shape factor in Stokes's formula is 0.154, as determined experimentally, instead of the factor (2/9) [ca. 0.223], which is customarily used and which applies only to spherical particles. A comparison of results obtained by the large-scale separation with those made by the pipette method shows very good agreement."

[**Toxicity of Anaconda phosphate**], C. E. Millar (*Michigan Sta. Rpt. 1928, p. 219*).—A marked toxicity of Anaconda phosphate applied in quantities as low as 10 lbs. to the acre in the row with white beans was attributed to the considerable content found of arsenic and copper.

[**Phosphorus needs in Montana**], E. Burke et al. (*Montana Sta. Rpt. 1929, pp. 88, 89, figs. 2*).—Phosphatic fertilizers gave increased yields in localities where deficiency in soil phosphate was indicated by a low phosphate content in forage crops. Triple superphosphate applied 200 lbs. to the acre in 1928 produced increases amounting to from 5.3 to 143.6 per cent in the yields of forage crops in 1929.

Home mixing of fertilizers, C. C. Fletcher (*U. S. Dept. Agr. Leaflet 70 (1930), pp. 8, figs. 3*).—Practical directions for purchasing and mixing fertilizer constituents are given, together with a figure showing graphically components which may be mixed (1) at will, (2) only immediately before application of the mixture, and (3) not at all.

AGRICULTURAL BOTANY

A glossary of botanic terms, B. D. Jackson (*London: Duckworth; Philadelphia: J. B. Lippincott Co., 1928, 4. ed., rev. and enl., pp. X+481*).—"The foundations of the list here presented are A. Gray's Botanical Text-Book, Lindley's Glossary, and Henslow's Dictionary, as set forth in the bibliography. To these terms have been added others extant in the various modern textbooks and current literature, noted in the course of reading, or found by special search."

Elements of horticultural botany, R. Gérard (*Éléments de Botanique Horticole. Paris: J. B. Baillière & Sons, 1928, pp. 400, figs. 144*).—The life of plants as viewed by the horticulturist constitutes the subject matter of this book.

A comparative study of deciduous trees and conifers [trans. title], P. Jaccard and A. Frey (*Jahrb. Wiss. Bot., 69 (1928), No. 4, pp. 549–571, pl. 1, figs. 12*).—A study of the morphological and histological differences between deciduous and coniferous trees shows that these differences are accompanied by physical-chemical differences in the wood which have significance in connection with such matters as filtration-resistance and sugar permeability.

Soil water relations as fundamental in plant growth, I [trans. title], H. Gradmann (*Jahrb. Wiss. Bot., 69 (1928), No. 1, pp. 1–100, figs. 22*).—A simple method is described as conditioning easy and reliable ascertainment of the absorptive capacity of given soils, as is also a second method practically applicable to soils of weaker absorptivity. A third section investigates the distribution of water in the soil spaces under different sets of conditions.

Dew and its importance in plant growth [trans. title], E. Hiltner (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 3 (1930), No. 1, pp. 1–70, figs. 14; abs. in Deut. Landw. Rundschau, 6 (1930), No. 3, p. 246*).—This article presents evidence to show that dew absorbed by the above-ground organs of plants is greater in amount and a more important factor in plant growth than it is generally

understood to be. The author maintains that water derived from this source, being free from salts, reduces the salt concentration of solutions supplied to the plant through the roots and thus plays an important physiological rôle. The amount of water and its physiological importance varies with different groups of plants. Wind, forest protection, and other conditions which reduce dew formation and absorption are discussed. An extensive bibliography is given.

Movement of material in plants, E. Münch (*Die Stoffbewegungen in der Pflanze. Jena: Gustav Fischer, 1930, pp. VII+234, figs. 30*).—Emphasizing the view that the problem of movement of material within plants is of special interest to those concerned with forestry, the author presents in this book mainly sections on the physics and the physiology of material movement, the development of theories bearing upon sap movement, his own conclusions, and a bibliography.

Osmotic values in plants of Central Asia [trans. title], A. W. Blagowestschenski (*Jahrb. Wiss. Bot., 69 (1928), No. 2, pp. 191–236*).—Copious data are given in tabular form with discussion.

Water uptake by intact plants [trans. title], F. Brieger (*Jahrb. Wiss. Bot., 69 (1928), No. 2, pp. 295–330, figs. 7*).—The construction, advantages, and use are outlined of a potometer for which superior advantages are claimed, with some observations, data, and conclusions resulting from its use.

Mechanism for the uptake of mineral matters by plants [trans. title], B. Niklewski, A. Krause, and K. Lemańczyk (*Jahrb. Wiss. Bot., 69 (1928), No. 1, pp. 101–118, figs. 5*).—The uptake of mineral constituents follows the laws of sorption phenomena in colloid materials. No exception to this has been noted. Supporting observations are particularized.

Studies in the biology of metals.—I, The localization of lead by growing roots. II, The retardative influence of lead on root growth, F. S. Hammett (*Protoplasma, 4 (1928), No. 2, pp. 183–191, pl. 1, figs. 3*).—The influence of metallic ions on the growth of living organisms is made the subject of systematic study, the particular aim being to extend existing knowledge regarding growth as a result of increase in cell number and of the factors contributing thereto. Root tips of certain seedlings are found convenient.

In the first part of the work here reported onion sets (*Allium cepa*), beans (*Phaseolus vulgaris*), and field corn (*Zea mais*) were germinated in sterilized sphagnum moss for 24, 48, and 72 hours, respectively. It is considered clear from the results that lead is absorbed by the actively growing roots. This tissue is therefore permeable to the lead ion. The fact that the lead absorbed is in large part localized by deposition in the regions of growth by cell division suggests that the chemical conditions incident to mitosis produce substances in predominant degree which react with lead in a selective manner.

Having found that lead accumulates most densely in the region of greatest mitotic activity, the author sought to determine the growth reaction of the root to the metallic ion. Seedlings of bean were the chief material used.

"The lead ion, in concentrations from 10^{-3} to 5×10^{-4}, retards the root growth of seedlings. In the marrowfat bean grown in carefully balanced nutrient solutions, the degree of retardation increases with the increase in concentration of lead."

Physiology of germinating seed.—I, Influence of inhibition conditions on gas interchange [trans. title], M. Geiger (*Jahrb. Wiss. Bot., 69 (1928), No. 2, pp. 331–356, figs. 9*).—Method, procedure, and data are detailed for a study of sprouting seeds of *Pisum sativum*, variety Victoria.

Root growth [trans title], W. Mevius (*Jahrb. Wiss. Bot., 69 (1928), No. 1, pp. 119–190*).—The sections of this contribution deal, respectively, with the

relation of roots to distilled water, their relation to boron, zinc, iron, and aluminum, and the significance of light for the establishment of adventive roots in the case of *Tradescantia fluminensis*.

The effect of sudden changes of temperature on protoplasmic streaming, S. F. Cook (*Jour. Gen. Physiol., 12 (1929), No. 6, pp. 793–803, figs. 7*).—A sudden drop in temperature of from 15 to 20° C. stops protoplasmic streaming in Nitella. The recovery of the normal rate follows a definite course, the time depending upon the temperature.

Evidence is adduced to indicate that the inhibition of streaming is due to a physical phenomenon.

Results of the temperature during flower formation for early hyacinths (l'Innocence and la Victoire), H. F. Waterschoot (*K. Akad. Wetensch. Amsterdam, Proc., 31 (1928), No. 1, pp. 31–49, pls. 2, fig. 1*).—Following up the work of Blaauw, one account of which has been noted (E. S. R., 43, p. 729), on the influence of various temperatures during flower formation on the whole hyacinth (Queen of the Blues), the present author examined the varieties l'Innocence and la Victoire.

For an optimal field culture, a temperature of about 25.5° C. (77.9° F.) for 8 weeks and then 17° appeared to be the best treatment for the late variety Queen of the Blues. The early varieties l'Innocence and la Victoire appeared to do better at 25.5° for a shorter period (5 weeks) and afterwards at 17°. These figures refer to healthy buds. Severely diseased buds may require different treatments.

Respiration and geotropism in Vicia faba, I, A. E. Navez (*Jour. Gen. Physiol., 12 (1929), No. 5, pp. 641–667, figs. 7*).—The results are given of the study of the relation between respiration and temperature in *V. faba* seedlings, also those from a study of the onset of geotropic response.

It is claimed that with care and with constancy of temperature constant excretion of carbon dioxide over fairly long periods can be obtained. It is stated also that while the Q_{10} ratio varies, the figure obtained for μ, the temperature characteristic (critical thermal increment), 16,250, is consistent with the values previously obtained for μ in respiratory oxidative processes in similar material. New data are given also on the reaction time for the root of *V. faba* seedlings excited geotropically. The study of the dependence of this time relation on temperature shows μ=16,110, agreeing quantitatively with the value deduced previously from the relevant data of earlier investigators indicated, this fact pointing to the importance of some respiratory oxidative process as the agency controlling the onset of geotropic curvative.

Vital coloration and respiration [trans. title], L. Genevois (*Protoplasma, 4 (1928), No. 1, pp. 67–87, pl. 1, figs. 4*).—The vital colorants, which tint selectively the "vacuome," augment the respiratory intensity in algal cells. Catalysis is involved, as is the accumulation of colorant in the cell. The presence of oxidizing organic molecules is a factor. The basic readily reduced colorants augment considerably the respiratory intensity, supposedly more than do any other substances. The acid colorants in neutral media have no effect.

GENETICS

Plant hybridization before Mendel, H. F. Roberts (*Princeton: Princeton Univ. Press, 1929, pp. XIV+374, [figs.] 48*).—"In the present work it is intended to present, in some fulness and detail, all the significant results obtained in the field of plant hybridization, down to the discovery of Mendel's papers in 1900."

Cotton inheritance studies: Lint percentage, J. F. O'Kelly and W. W. Hull (*Mississippi Sta. Tech. Bul. 18 (1930), pp. 15, figs. 4*).—The inheritance of lint percentage was studied in the F_1, F_2, and back-crosses of hybrids variously involving inbred strains of Cleveland (pure for low percentage and fuzzless), Half-and-Half, Miller, Okra Leaf, Trice 78 and 78F, and sea island cottons.

In cases where the segregation was well defined, lint percentage appeared to be controlled by a single factor pair and high percentage partly or completely dominant. The nature of the segregation could not be determined definitely in interspecific crosses and in crosses between upland strains where the percentage differences were narrow.

[Effect of age of pollen on sex of hemp], E. A. Bessey (*Michigan Sta. Rpt. 1928, p. 170*).—These studies are said to have shown conclusively that age of pollen has no effect on the sex of the progeny and is, therefore, not a factor in sex determination.

The inheritance of body weight in relation to milk secretion, C. W. Turner (*Missouri Sta. Research Bul. 147 (1930), pp. 42, figs. 4*).—The results are reported of a study of the inheritance of body weight and fat production as well as the relationship between fat production and body weight in Jersey cattle, based on the Register of Merit records prior to 1921, for which the actual or estimated body weight of all cows was reported.

Comparisons of the changes in body weight and yearly fat production between dams and their daughters indicated that Jersey sires might cause significant changes in yearly fat production without material change in body weight. Regression lines were fitted to these data for different groups, and it was found that the body weight of the daughters increased about 16 lbs. for each 100 lbs. increase in body weight of the dams and that fat production increased approximately 20 lbs. for each 100 lbs. increase in body weight above 342.3 lbs. These findings were based on the conversion of fat production and body weight to mature equivalents. Based on the observations it was estimated that the greater production of large cows at best only slightly exceeded the cost of obtaining the additional product.

Conversion factors were formulated for converting body weight to the 2-year-old equivalent, and certain advantages are noted for the use of the weight so corrected.

The effect of the estrus producing hormone on the growth of the mammary gland, C. W. Turner and A. H. Frank (*Missouri Sta. Research Bul. 145 (1930), pp. 56, figs. 52*).—The development of the mammary gland in the rabbit during gestation, from birth to puberty, during puberty with continuous oestrum and with pregnancy and pseudopregnancy, and during lactation are described in detail. Three series of experiments were conducted, involving the injection of oil extracts of the oestrum-producing hormone into male rabbits and females ovariotomized before puberty, to study the influence of the hormone on the development of the mammary gland.

It was found that daily injections of approximately 20 rat units of the oestrum-producing hormone for a period of 30 days caused growth of the duct system of the glands in the castrated male and female rabbits equal to that produced during continued oestrum in the normal female, and a slight milk secretion resulted. Increasing the dose beyond this amount appeared to have no greater effect. The oil extracts used included oil from the urine, refractionated oil, residual oil, olive oil, and purified hormone, but none would produce the type of growth of the mammary gland characteristic of pregnancy.

A study of the estrus producing hormone in the urine of cattle during pregnancy, C. W. Turner, A. H. Frank, C. H. Lomas, and C. W. Nibler (*Mis-*

souri Sta. Research Bul. 150 (1930), pp. 43, figs. 13).—The studies of the oestrum-producing hormone content of the urine of 45 dairy cows are reported in somewhat more detail than was previously noted (E. S. R., 63, p. 26), and similar data are also reported for 32 beef cows.

The increase in the hormone production with advance in pregnancy was found to be expressed by an equation of the form $H=Ae^{kt}$, in which H is the daily hormone secretion at any time t, A is the initial daily level of production, k is the rate of increase, and e is the base of natural logarithms. Dairy and beef cattle were found to differ in that dairy cattle showed a noticeably higher level of secretion after 100 days of gestation, while beef cattle did not show a noticeable increase until 180 days of gestation. Certain changes in the daily secretion of urine in dairy and beef cattle which were associated with pregnancy were also noted.

Double adrenalectomy and the oestrous cycle in the white rat, A. L. Schiffer and L. B. Nice (*Amer. Jour. Physiol., 95 (1930), No. 2, pp. 292, 293*).—In two series of experiments using 14 and 9 virgin female rats, the duration of the oestrous cycles were compared both before and after double adrenalectomy. In the first series of experiments the average duration of the oestrous cycles was 4.26 days before the operation and 4.38 days after the operation, and in the second series of experiments the duration of the cycles averaged 4.63 days before the operation and 4.72 days after the operation. "The differences before and after operation are so slight it is clear that double adrenalectomy did not appreciably affect the length of the oestrous cycles in these two groups of rats."

The induction of the pseudo-pregnancy vaginal reaction in spayed mice by the injection of human blood, C. F. Fluhmann (*Amer. Jour. Physiol., 95 (1930), No. 2, pp. 422–426, fig. 1*).—Results of tests of the effect of injections of human blood in producing mucification of the vaginal mucosa in mice characteristic of that accompanying pregnancy showed that not only blood from patients in whom active corpora lutea were present brought about this condition, but mucification was also induced by blood from men, from one woman following double ovariotomy, and from four women past menopause.

FIELD CROPS

[Farm crops work in Michigan], R. P. Hibbard, E. J. Miller, and H. C. Rather (*Michigan Sta. Rpt. 1928, pp. 172, 176, 177, 201–205*).—Experiments with field crops (E. S. R., 61, p. 432) again reported on comprised cultural tests with sugar beets and corn and breeding work with sugar beets (E. S. R., 63, p. 231), oats, field beans, alfalfa, rye, and fiber flax. Improved varieties included a selection of Mexican Tree field beans, productive strains of alfalfa, winter hardy strains of wheat, and a tall, pink-flowered strain of fiber flax resistant to lodging.

The cultural tests indicated that corn could be planted with safety one month earlier than May 20, the average date at present; that a definite relation exists between the sugar yield per acre from sugar beets (E. S. R., 61, p. 730) and cultural methods; and that fiber flax yields better when planted early in the spring about 0.5 in. deep than from later or deeper plantings.

Milling and baking tests (E. S. R., 61, p. 731) and analyses were completed on wheats of the 1927 crop. Results thus far indicated that considerable seasonal variation exists in the moisture and protein content of wheat and flour, that the correlation between protein content and baking quality of flour is not so strong as might be anticipated, that in order to bake the best bread from Michigan wheat flour the periods of fermentation and proof must be

short, and that good bread may be made from the harder varieties of Michigan-grown wheats.

[Agronomic experiments in Montana], C. McKee, W. O. Whitcomb, D. Hansen, I. J. Jensen, G. Morgan, F. M. Harrington, E. Burke, et al. (*Montana Sta. Rpt. 1929, pp. 24–29, 31–33, 34–49, 89, 90, figs. 10*).—The progress of various experiments with field crops at the station and substations (E. S. R., 62, p. 219) is reported on again.

Varietal leaders included Montana No. 36 and Newturk winter wheat; Marquis, Supreme, and Reliance spring wheat; Federation, a white spring wheat of chief value for feed grain in irrigated sections; Trebi barley; Victory and Markton oats; Newland flax; and Ladak and Grimm alfalfa.

Wheat following legumes in rotations greatly outyielded wheat after wheat or potatoes. Differences in quality of grain as measured by crude protein content were slight, yet, considering the total acre yield of crude protein, there was a large margin in favor of the rotations with legumes. Weeds were serious after 5 years in continuously cropped plats and in rotations omitting a cultivated crop, alfalfa, or red clover. In the several rotations, potatoes after red clover (1 year) yielded 304.7 bu. per acre, with 86.2 per cent marketable; the second year after alfalfa (3 years) 290.5 bu., 87.7 per cent; in a 2-year rotation with wheat 120.3 bu., 74.9 per cent, continuously cropped, manured, 283.6 bu., 92.1 per cent, and continuously cropped 182.2 bu., 80.8 per cent marketable. For maximum benefit to potatoes, alfalfa evidently should remain down at least 3 years. Alfalfa and red clover largely increased yields of crops immediately following, and beneficial effects were apparent several years after they were plowed up.

Flax on irrigated land from 1924 to 1929 averaged 20.9 bu. per acre and comparable Marquis wheat 40.8 bu., with average gross acre values of $43.31 and $43.80, respectively. Growing flax in mixture with Marquis wheat resulted in higher gross returns than from either alone, $49.23 per acre coming from the rate of 14 lbs. of flax with 30 lbs. of wheat and $51.19 from 14 lbs. of flax with 45 lbs. of wheat.

Economically important findings of the grain inspection laboratory, mostly noted earlier, were that frosted wheat has better milling and seed value than supposed; that dockage from wheat often contains much grain of feed value for local use; that wheat overwintered in the shock, while lowered in seed and market quality, remained much the same in protein content and in baking quality of flour; that green seed of alfalfa and sweetclover, if not shrunken, and hard seed of alfalfa can produce good plants; and that sweetclover has more resistant hard seeds than alfalfa, scarification being beneficial when hard seed amount to 50 per cent or more or the seed are in the hull. In 5,865 tests on the 1928 wheat crop the laboratory found the protein content of spring wheat to average 12.7 per cent, ranging from 8.8 to 20, and in winter wheat 11.7 per cent, ranging from 8.22 to 19 per cent. Grain grading activities are also reviewed.

Fallowing was found to increase both the yield and protein contents of spring and winter wheats. Treatment with ammonium sulfate resulted in higher grain yields but practically no increase in protein content. At the Northern Montana Substation wheat on fallow land, both with and without manure, produced larger yields with higher protein content than did wheat continuous or on manured or unmanured cornland.

Sets from the seed end and the middle of a potato tuber were found about equally productive, both outyielding sets from the stem end. Netted Gem tubers injured during harvest and remaining sound over winter were more productive than normal tubers, whereas similarly damaged Bliss Triumph

potatoes did not yield so well as tubers escaping fall injury. Indications were that, under the conditions, delay of planting to June 15 would materially reduce the yield of tubers larger than 12 oz., but earlier planting is more profitable because of the greater yield of seed sizes and of larger tubers. With Bliss Triumph, late May planting was more productive than early May, and the reverse was true for Netted Gem.

Spacing of hills and size of set studies showed that closer spacing or larger sets can be used for growing seed than for commercial potatoes. For seed production larger sets are preferable to the closer spacing of hills, making for greater efficiency in roguing. Hills may be closer together or larger sets planted in more fertile and better watered fields where conditions favor the proper development of the larger number of tubers formed. On very fertile, well-watered soils 3-oz. or 4-oz. sets may be planted to advantage, whereas under some dry land conditions 1.5- to 2-oz. sets may be most profitable. There was further evidence that no marked differences exist between irrigated and nonirrigated seed potatoes. Irrigated seed generally contains the larger tubers, and a high percentage often is eliminated as too large, unless definite size control measures have been adopted. Greenhouse tuber index work seemed to be the best means of judging the value of seed stocks, especially as to mild mosaic. Early potatoes were found most dependable for dry land at Huntley, although midseason sorts were more productive in favorable seasons.

The beneficial effects of alfalfa and manure in the crop rotation in maintaining or increasing crop yields continued to be a feature of the irrigated rotation experiments conducted at the Huntley Substation in cooperation with the U. S. Department of Agriculture. The response of sugar beets in such rotations was detailed earlier (E. S. R., 60, p. 636). The wax pod type of Great Northern beans averaged about 200 lbs. per acre more than the striped pod type. Indications were that seed grown on dry land may surpass irrigated seed, largely due to freedom from disease.

In the dry land rotation and tillage experiments at Huntley, practically no difference was noted between yields of crops grown on spring-plowed land and on fall-plowed land. Tillage deeper than 8 in. failed to increase yields over those from shallower and cheaper plowing. Grain yields from disked stubble land about equaled those from plowed stubble land, a costlier preparation. Small grains and flax usually produced highest on summer-tilled land, but the most profitable returns generally were had from small grains on disked corn land or bean land. Stubble land fall plowed, left rough over winter, and summer tilled the next season produced larger yields of winter and spring wheat than did other summer fallow treatments.

Indications were that flax might often further replace wheat as a dry land cash crop. Yields of corn and grain after flax equaled and often exceeded those from continuous corn and grain. Small grains after corn in rotation usually outyielded small grains continuous or following flax in the rotations. When drilled in clean cornland without plowing, the small grains cost less and usually yielded as well as or better than small grains on plowed cornland. Corn has been grown more cheaply and productively on listed than on plowed ground; it outyielded sunflowers for forage and silage on the dry land, and wheat after corn yielded better than wheat after sunflowers. Winter and spring wheat following field beans generally yielded more than after corn, and the grain was higher in protein content. As a pasture forage for pigs alfalfa proved superior to bromegrass.

Sweetclover, crested wheatgrass, and bromegrass had certain merits for pasture at the Judith Basin Substation. Sweetclover and alfalfa were about equal

in pasture value for hogs on dry land. Acre yields on different tillage treatments are tabulated for 1929.

For grain at the Northern Montana Substation, 8-in. plowing continued to outyield 4-in. plowing and was more economical than 8-in. plowing subsoiled. Ladak alfalfa yielded more than Grimm, both in 3-ft. rows and close drilled. Slender wheatgrass outyielded crested wheat and brome in the order named. Brome and slender wheatgrass produced more in 3-ft. rows than in close drilled, while crested wheat made about the same in rows and drills. Spring rye grown on fallow led the hay crops, although midseason oats yielded about the same as spring rye when both were grown on cornland or after wheat. Stands were better when alfalfa was seeded alone than with flax, and better from the later dates of seeding, May 10 and June 5.

Maximum yields were obtained on land plowed for fallow before June 1. Fall plowing with enough cultivation during the next summer to control weeds proved to be one of the best methods, provided the land was not worked down just after plowing. Weeds, drought, and disease have made flax culture hazardous on old land. Seeding on old land evidently should be delayed until the seed bed is cleared of weeds, about May 15.

Growth behavior and maintenance of organic foods in Bahia grass, W. A. Leukel and J. M. Coleman (*Florida Sta. Bul. 219 (1930), pp. 56, figs. 17*).—The growth behavior, production of top growth, variation in weight of and the difference in the percentages and quantities of organic stored foods in stolons and roots of Bahia grass cut often, mature and cut in the seed stage, and when grown to maturity without cutting treatment were studied during 1927 and 1928. The progress of this work has been noted (E. S. R., 63, p. 627).

The green top growth from frequent cuttings was equal in quantity to that from one cutting in the seed stage plus the vegetative aftergrowth the first year, whereas more dry top growth was produced from the second treatment. The second year green and dry top production was greater from the grass cut frequently. The total accumulated dry top growth made by plants cut often gradually increased from one date to another throughout both growing seasons. The dry weight of top growth produced by plants grown to maturity gradually increased up to the period of maximum seed production and gradually decreased thereafter. The total quantity of top growth from the plants cut frequently was the greater during both seasons. Plants cut often the previous season produced a more vigorous and uniform early spring top growth than did plants grown to maturity, which made a very sparse spring growth accompanied by an abundance of exhausted dead stolons.

Top growth removed by cutting and that on the plants from the area cut over frequently when samples were dug contained a more uniform and higher percentage of nitrogen during the entire season than that from plants grown to maturity. In the latter a gradual decrease in percentage of nitrogen took place approaching the more mature growth stages. Vegetative aftergrowth following the cutting of the tops of these plants in the seed stage was again higher in percentage of nitrogen. The quantity of nitrogen produced from the 15 cuttings the first year was somewhat less than that from one cutting in the seed stage plus that from the aftergrowth, which in turn in the second season was exceeded by the nitrogen from the 13 cuttings from the area cut often. The top growth on plants cut frequently showed a narrower relation between total hydrolyzed carbohydrates and total nitrogen throughout both seasons, associated with a more vegetative top growth production, than in the top growth of plants grown to maturity, which was associated with greater seed production.

A more horizontal growth of stolons and more leaf growth took place where plants were cut often, whereas plants not cut made a more upright growth of stolons in the form of seed stems and produced a thinner sod. Plants grown to maturity increased more in dry weight of stolons than plants cut often in 1927, and the trend was similar, although the difference was smaller, in 1928.

The stolons, and to some extent the roots, appeared to be plant parts where the organic foods are stored, as in such upright growing plants as alfalfa and timothy. The production of immature top growth was accompanied by a slight decrease of the organic foods stored in the stolons and roots but not to the same extent as in upright growing plants. The decrease in percentage of such foods beyond a certain degree appeared to result in the extinction of some of the stolons and roots. The more persistent growth of Bahia grass when cut frequently in contrast to upright growing plants seemed due to its prostrate growth habits. The elaboration of organic foods by the more horizontal leaf area not removed by cutting appeared to be adequate for the growth and maintenance of the plants

Proceedings of the sixteenth annual meeting of The Potato Association of America (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 244, figs. 7*).—The sixteenth annual meeting of the association, held in Des Moines, Iowa, from December 30, 1929, to January 1, 1930, is reported on, and the activities of the organization and of its committees in 1929 are summarized. The papers presented include several abstracted below, together with the following: President's Address, by F. M. Harrington (pp. 5–7); Potato Breeding Problems, by C. L. Vincent (pp. 63–69); The Occurrence of Vitamin C in Two Varieties of Potatoes Grown under Similar Conditions, by J. E. Richardson, D. Douglass, and H. Mayfield (pp. 69–73); The Influence of Photoperiod upon Potato Seed Stock, by R. H. Roberts (pp. 108, 109); The History of Seed Potato Certification in Ohio, by J. Bushnell and E. B. Tussing (pp. 133–136); Seed-Potato Treatments in Florida from 1924 to 1929 (pp. 136–146) and Potato Dusting and Spraying Experiments in Florida from 1924 to 1928 (pp. 146–154), both by L. O. Gratz; Some Preliminary Experiments with Burgundy Mixture in New Brunswick, by D. J. MacLeod and J. K. Richardson (pp. 154–160); The Effects of Certain Cultural Practices on the Transmission of Virus Diseases of the Potato, by T. M. McCall (pp. 161–163); Roguing and Potato Virus Disease Control, by J. E. Kotila (pp. 164–168); The Farm Board and the Potato Industry, by E. A. Stokdyk (pp. 177–185); Report of Research Committee, by W. Stuart (pp. 186–188); Report on Potato Breeding in 1929, by C. F. Clark (pp. 190–194); Report on Potato Disease Research in 1929—Part of Report of Research Committee, Potato Association of America, 1929, by F. Weiss (pp. 196–200); and Report of the Seed Potato Certification Committee, 1929, by W. H. Martin (pp. 205–207).

An historical résumé of the development of the potato since its discovery, W. Stuart (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 7–55, fig. 1*).—The development of the potato is traced from before the advent of the Europeans in South America to the present time, lists of 217 varieties or so-called varieties of American origin and 12 of English origin whose parentage it was possible to trace back to the old Garnet Chili and of the varieties originating in different States and Canada are included, and foreign potato breeding activities are reviewed briefly.

Relative productivity of certain types of potato seedling populations, F. A. Krantz and R. M. Bailey (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 56–63*).—Yield tests of potato seedlings by the Minnesota Experiment Station, cooperating with the U. S. Department of Agriculture, gave indications that so far as yield alone is concerned the Cobbler variety presents a genetic com-

bination superior in yield expression to the average of its progenies. The mean yield of Triumph seedlings practically equaled that of the parent. Study of the individual yields of the Triumph and Cobbler seedlings showed that the yield increased as their period of growth was extended. Yield was correlated with maturity. It was evident that to secure early maturity as well as high yield, selection must be confined to a small portion of the population with relatively low yields. The yields of inbred lines from an F_1 seedling of Keeper × Silverskin during 5 years showed quite conclusively that a reduction in yielding ability takes place, and that reduction occurs during the early generations of selfing. Field trials demonstrated that F_1 families offer better opportunities for selecting high yielding seedlings than inbred or varietal families.

The effect of weight of seed piece on the size of its sprouts, J. Bushnell (*Potato Assoc. Amer. Proc., 16 (1929-30), pp. 95-100*).—Comparison at the Ohio Experiment Station of sets of Russet Rural potatoes ranging from ¾ to ⅛ oz. showed that the plants and the yield progressively decreased as sets were smaller. The difference in size of plants from ¾-oz. and 1-oz. pieces was not discernible in the field but was evident when plants were dug and measured. Plants from 1-oz. pieces when 30 cm. high were about 1.5 cm. taller than those from ¾-oz. pieces. From sets weighing more than 1 oz. the largest plants were no longer than the largest from the 1-oz. pieces, but when the largest plant was removed from each piece the remaining plants on the 2-oz. pieces averaged longer than those on the 1-oz. pieces.

The relative vigor of the bud and the stem ends of the same potato seed tuber, K. C. Westover (*Potato Assoc. Amer. Proc., 16 (1929-30), pp. 101-105*).—The mean measurements of bud and stem and hills from the same tubers by groups of 6 to 8 oz., 8 to 10 oz., and 10 oz. or more, and in combination, as analyzed at the West Virginia Experiment Station, did not appear to indicate a real difference in vigor between the bud and stem ends of the same seed potato. However, in the combination of the different groups which represents the commercial pack of No. 1 seed stock there was a tendency for the bud end to produce more stalks per hill.

The relation of greensprouting to growth and yield of potatoes, E. V. Hardenburg and A. G. B. Bouquet (*Potato Assoc. Amer. Proc., 16 (1929-30), pp. 73-82*).—Comparison of greened and ungreened Green Mountain and Rural potatoes for seed (E. S. R., 62, p. 732) at Cornell University in 1928 and 1929 demonstrated that among the definite effects of green sprouting derived were a more rapid emergence, a reduction in stems per plant, an increase in stolons per stem, and an increase in percentage of U. S. No. 1 yield per acre.

Amputation of mother-tubers from potato sprouts at intervals after planting, F. E. Denny (*Potato Assoc. Amer. Proc., 16 (1929-30), pp. 87-95*).—Supplementing previous work (E. S. R., 60, p. 816), the effects of removal of potato sets weighing 14 and 56 gm. were studied at the Boyce Thompson Institute for Plant Research.

The removal of mother tubers when germination was complete and leaves fully expanded reduced the yield of both Irish Cobbler and Bliss Triumph plants, the reduction being greater for the 56-gm. set than for the 14-gm. and for the Irish Cobbler than for Bliss Triumph. Removing mother tubers when plants were 10 in. high and had fully formed young tubers reduced the yield of the Irish Cobblers by about 14 per cent when 56-gm. sets were amputated and for 14-gm. sets 7 per cent. Amputation of Bliss Triumph mother tubers at this stage did not reduce the yield significantly for either size of set. When plants were of about full height and in bloom, removing mother tubers did not reduce yields for either size of set of either variety.

Analyses revealed large and rapid losses of dry weight, starch, and nitrogenous substances, which were greater for Bliss Triumph than for Irish Cobbler and were greater for 14-gm. than for 56-gm. sets. The loss from the 56-gm. sets, however, was surprisingly large. Moisture and sugar were observed to increase in Irish Cobbler mother tubers progressively throughout the growth period, while with Bliss Triumph the increases early in the season were followed by decreases toward the end of the study.

Potato yields increased by removing first sprouts, H. D. Brown (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 106, 107*).—The yields of Rural potatoes grown at the Indiana Experiment Station from seed with and without induced and natural sprouts gave indications that when sprout removal induces general sprouting the reduced vigor resulting from sprout removal is more than offset by increased yield due to a better stand. The fact that cut potatoes rot under conditions often prevalent in June in Indiana would seem to indicate that the late crop should be planted earlier or that small whole potatoes grown especially for seed purposes should be used.

Prevention of sprout-tuber (or "kindel" tuber) formation by chemical treatment, F. E. Denny (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 83–87, fig. 1*).—Tubers of Garnet Chili potatoes planted at the Boyce Thompson Institute for Plant Research without treatment produced sprout tubers, whereas tubers from the same lot soaked in solutions of sodium thiocyanate and thiourea did not form sprout tubers but sprouted in the normal manner. Sets which had produced sprout tubers and were then treated with ethylene chlorohydrin, thiourea, and sodium thiocyanate sprouted promptly; sprouts developed not only from the young sprout tubers but also from the eyes of the original mother tuber. Thiourea induced the development of sprouts from several eyes on each sprout tuber.

The effects of vacant hills and of plat competition upon the yield of potatoes in field experiments, H. O. Werner and T. A. Kiesselbach (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 109–120*).—Problems of competition between adjacent rows of potatoes and the effect of missing hills upon plant yields were investigated at the Nebraska Experiment Station during 1926, 1927, and 1929.

With normal field conditions in which potato sets were dropped at 15-in. intervals in rows 3 ft. apart yield reductions were not proportional to losses in stand. Plants surrounding vacant hills benefited from the lessened competition, and the tuber yield was increased. With 1-hill skips a total of 68.2 per cent of the loss was recovered in 10 surrounding hills within the same and adjacent rows in 1927 and 58 per cent in 1929. Of the loss due to a 2-hill vacancy, 52.7 per cent was recovered by 12 surrounding hills in 1929, while with 3-hill skips 31.7 per cent of the loss was recovered in 14 surrounding hills. Of the recovery by plants surrounding 1-hill vacancies, 63 per cent occurred in the same row and 37 per cent in the two adjacent rows in 1927, and 85.2 and 14.8 per cent, respectively, in 1929. In the case of 2-hill vacancies in 1929, 71.9 per cent of the total recovery was in the same row and 28.1 per cent in the adjacent rows, and correspondingly with 3-hill vacancies in 1929 81.3 and 18.7 per cent. The percentage recovery by surrounding hills was modified by the distribution of vacant hills.

That plat competition may be a source of serious error in field experiments conducted to determine correct relative yields was shown by the large sets of Irish Cobbler potatoes producing 43.5 per cent greater total yield of tubers per acre as a 2-year average than small sets when compared in well replicated 1-row plats, while the increase was only 13 per cent when calculated for the

interior rows of 4-row plats. With 4-row plats the effects of border competition in distorting relative yields were reduced considerably through elimination of the border rows from the yield data. When tubers of No. 1 size only were considered, the same general principles of plat competition were apparent, although the relative yields from large and small sets were changed materially.

Some facts concerning the productivity of irrigated seed potatoes, H. O. Werner (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 120–132*).—A number of comparative tests by the Nebraska Experiment Station demonstrated that when spindle tuber was present in seed stocks irrigated seed potatoes degenerated, as to productivity and quality of tubers, much more rapidly than did stocks grown on dry land, and such deterioration of the irrigated stock increased with each additional year of irrigation. Although irrigation practice was detrimental to seed stocks containing spindle tuber, a variation in the quantity of water or in the manner of applying it was not significant. With healthy tubers, especially with no spindle tuber present, irrigation or dry land grown seed potatoes appeared of equal value wherever tested.

Some facts concerning potato storage in New York, E. V. Hardenburg and A. L. Wilson (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 168–177*).—From the results of a survey by the New York Cornell Experiment Station in 1928 and 1929 information is given on the types, sizes, utilization, and efficiency of storage structures in New York. The results of a test in 1929 of the influence of storage on the quality of seed potatoes are summarized.

Potato production in the far Western States, W. Stuart (*U. S. Dept. Agr., Farmers' Bul. 1639 (1930), pp. II+17, figs. 8*).—Cultural methods and field practices used in growing potatoes under irrigation are outlined, with information on soils, seed, spraying and dusting, and storage. Cultural practices and production centers are indicated specifically for Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

This publication supersedes Farmers' Bulletin 953 (E. S. R., 39, p. 442).

Chemical seed treatments for sorghums, A. F. Swanson and R. E. Getty (*Jour. Amer. Soc. Agron., 22 (1930), No. 5, pp. 472–475*).—The effect of treatments with four commercial chemicals on the germination of Red Amber sorgo and Dawn kafir, both with hard seed, and feterita, with soft seed, was studied in cooperation with the U. S. Department of Agriculture at the Fort Hays, Kans., Substation.

The harder seeds, i. e., those of Red Amber sorgo and Dawn kafir, responded very little in the nursery to treatment in 1927, although some benefit occurred in 1928, whereas feterita was helped decidedly in both seasons. When sound seed of other than soft-seeded sorghums is sown, treatment is deemed unnecessary for a good stand under favorable conditions. However, the risk of cold, wet weather following seeding and the possibility of kernel smut may make a chemical treatment advisable. Stimulation of vegetative vigor was not noted in the seedlings from treated seed over those from untreated seed at emergence or thereafter. Increased yields in field trials from the chemical treatment of feterita was due largely to more plants per acre than with untreated seed.

Sugar-beet culture in the humid area of the United States, J. G. Lill (*U. S. Dept. Agr., Farmers' Bul. 1637 (1930), pp. II+32, figs. 23*).—Production practices outlined for sugar beets in the humid area of the United States are based on investigations in cooperation with the Michigan Experiment Station. Information is presented on adaptation, soil and fertility needs, cultural methods and field practices, by-products, and insect pests and diseases. This publication supersedes Farmers' Bulletin 568 (E. S. R., 30, p. 529).

HORTICULTURE

[**Horticultural investigations at the Michigan Station**], R. P. HIBBARD and V. R. GARDNER (*Michigan Sta. Rpt. 1928, pp. 171, 172, 213, 214*).—Hardened tomato plants set in the field withstood frost at 31° F. with 44 per cent survival, as compared with 83 per cent for plants protected by individual covers. A second lot of plants set out a few days later and exposed to 32° frost showed 75 per cent survival. Glass covers were not at all satisfactory as protectors.

In closing a pruning study with mature apple trees, it is reported that very light pruning resulted in increased yields, and, although the size of apples was reduced, the net returns were greater than from heavy or even moderate pruning. Evidence was secured that bees are highly important in securing a satisfactory set of most tree and some small fruits. Of the three fertilizer elements, nitrogen, phosphorus, and potash, nitrogen was the only one of importance in cherry production and was also important in grape culture, promoting growth and yield. Brix readings of the extracted juice of grapes failed to show any marked relationship between sugar content and fertilized treatment.

[**Horticultural investigations at the Montana Station**], F. M. HARRINGTON, C. C. STAEBING, and W. E. POLLINGER (*Montana Sta. Rpt. 1929, pp. 49–56, figs. 4*).—In this annual report (E. S. R., 62, p. 227), further information is presented on premature seeding of celery. Plants set in the field after June 6 gave less seeders than those set May 20, especially so in the case of plants taken from a cool greenhouse. Under some environments there was considerably less seeding when the plants were grown in either very poor or very rich soil in the flats, when plants had been checked by light watering in the greenhouse, or when watered heavily in the field after setting. Strains and varieties of celery differed greatly in their susceptibility to seeding. Giant Pascal, White Plume, and Winter Queen appeared more susceptible than Easy Blanching, Golden Plume, and Golden Self Blanching, with differences between strains of the same variety. Growing celery plants at temperatures around 65° F. or higher is conceded the best preventive for premature seeding.

Tying tomato plants to upright stakes without pruning proved highly advantageous in increasing the percentage of early ripe fruit and of No. 1 fruit throughout the season, although the total crop was less than on decumbent vines. Over a 5-year period tomato transplants from the greenhouse produced more early ripe fruit than did hotbed transplants. Heavy irrigation until August 1 followed by light irrigation, light irrigation followed by medium, and medium followed by light gave better results than did the continuation of any one type of irrigation. Over a 3-year period transplants from 4-in. pots were slightly better than those from 3-in. pots. Peat and other composition pots were not as satisfactory as clay. One year's results indicated that superphosphate has value in increasing the quantity of early ripe tomatoes and also the total crop.

Removal of the young heads of Copenhagen Market cabbage while about the size of walnuts increased the number of heads per plant but delayed maturity. No material difference was noticed in production whether cabbage plants were grown in the greenhouse or in hotbeds. Lettuce plants responded favorably to an early start under glass. Both phosphorus and potassium fertilizers increased the percentage of No. 1 lettuce heads but had no effect on size. Plants receiving nitrate of soda alone yielded about the same as the checks. The desirability of reducing irrigation during the maturing stage of lettuce was shown. Among sweet corn varieties Pickaninny was consistently the first to ripen. Latham, Ohta, and Sunbeam red raspberries fruited consistently over a 4-year period, but covering the plants with soil in winter resulted in larger

yields sufficient to offset the additional labor. Thinning raspberry hills to seven or eight canes combined with light tipping proved the best pruning method.

In studies in the Bitterroot Valley, fertilizing McIntosh apple trees gave good results in longer terminal growth and more regular production. Nitrogen fertilizers gave distinct increases in growth and in size of fruit, but when used alone reduced color, that of the check trees being rated 74.6 per cent in 1929 as compared with 51.7 per cent for the nitrogen trees. Phosphates, on the other hand, apparently had a favorable influence on color, giving 75.2 per cent when used alone and 72.8 per cent when used with nitrogen. Trees receiving phosphorus held their fruit better than did those receiving nitrogen alone. Potash, on the other hand, had no favorable effect on color when used with nitrogen but apparently was beneficial when used in a complete fertilizer. The complete mixtures on the whole gave highly promising results with both mature and young apple trees. Very distinct benefits were noted in the fruit set of McIntosh trees having Delicious trees adjacent, and the June drop was less on these trees. In the case of sour cherries it was noted that sharp angled branches are a hazard and should be removed at the time of planting.

Fertilizer experiments with truck crops, J. J. Skinner and R. W. Ruprecht (*Florida Sta. Bul. 218 (1930), pp. 65, figs. 19*).—This bulletin is presented in three parts, as follows:

I. *Celery and lettuce on Leon fine sand.*—Studies conducted in the vicinity of Sanford showed that the yield, size, and quality of celery were greatly influenced by commercial fertilizer, and that applications as large as 8,000 to 10,000 lbs. per acre were profitable. The best results were obtained with a mixture containing from 6 to 8 per cent of nitrogen, the value of potash apparently depending on first satisfying the nitrogen needs of the crop, whereas phosphorus had no apparent influence, although its inclusion is advised to prevent nutritional disturbances. A fertilizer containing 6 per cent ammonia, 2 per cent phosphoric acid, and 8 per cent potash gave the largest yields of celery. Lettuce had essentially the same fertilizer requirements as celery.

As sources of the several nutrients, superphosphate, a mixture of organic and inorganic nitrogen materials, and either muriate or sulfate of potash proved satisfactory. Fertilizers made from synthetic and pure salt chemicals gave good results as compared with better known materials.

II. *Tomatoes on calcareous Glade soil.*—Tomato fertilizer studies in Dade County on Glade soils which are frequently submerged in the rainy season and are deficient in some of the uncommon but essential food elements, such as manganese, copper, and boron, showed that a mixture consisting of from 4 to 6 per cent ammonia, 6 to 8 per cent phosphoric acid, and 6 to 8 per cent potash is most desirable. Organic nitrogen materials in complete fertilizers gave better results than did mineral sources, but a mixture of one-half to three-fourths organic with mineral nitrogen gave practically as good results. Lesser yields from equivalent quantities of synthetic and pure salts are thought due to the absence of impurities which often contain some of the uncommon but essential elements above noted.

III. *Truck crops with manganese on calcareous Glade soil.*—Seeking to explain the failure of common fertilizers to fully replace animal manures for truck crops on Glade soils, tests were made of manganese supplements, with the result that tomatoes were grown successfully without manure when from 50 to 100 lbs. of manganese sulfate were used in addition to commercial fertilizer. Mixing the manganese sulfate with the other fertilizer was found the most successful method of handling. Comparable results were secured with tomatoes, potatoes, beans, cabbage, cauliflower, carrots, beets, and corn.

Asparagus culture, R. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 1646 (1930), pp. II+25, figs. 8*).—This publication, a revision of and superseding Farmers' Bulletin 829 (E. S. R., 38, p. 41), is a general discussion of asparagus production, including information derived from recent experimental studies. It is pointed out that strong one-year-old plants are best for establishing asparagus plantings, and certain of the new rust resistant varieties are discussed. The section on asparagus rust was revised by W. W. Gilbert, and that on insect pests was prepared by W. H. White.

Growing onions on the muck soils of New York, J. E. KNOTT (*New York Cornell Sta. Bul. 510 (1930), pp. 34, figs. 9*).—Based on the results of surveys and of experimental work, there is presented a comprehensive discussion of the best known cultural practices, with suggestions for changes where needed.

In respect to the fertilizer requirements of the onion on muck soil, it was evident that the length of period under cultivation and the soil acidity reaction are highly important factors. Mucks under culture for less than 10 years failed to respond to increased quantities of nitrogen or significantly to phosphoric acid but did make fair response to potash. Mucks under cultivation for more than 10 years showed a high correlation between increased quantities of nutrients and larger yields of onions. An application of 1,000 lbs. per acre of a 0–12–18 analysis is recommended for onions on new, slightly acid muck. For very acid mucks and for slightly acid mucks long under cultivation the formula is changed to include 3 per cent of nitrogen. Supplemental side dressings of quickly available nitrogen are recommended in the case of long used and rather acid mucks.

Various other aspects of onion growing, such as rate of seeding, planting, varieties, tillage, and pest control are also discussed.

The effect of spiral ringing on solute translocation and the structure of the regenerated tissues of the apple, L. H. MACDANIELS and O. F. CURTIS (*New York Cornell Sta. Mem. 133 (1930), pp. 31, pls. 5, figs. 11*).—Although the removal of a spiral ring of bark tissues in one instance and of bark tissues plus the outer ring of xylem in the other had some limiting effects on the movement of solutes, nitrogen and catalase determinations of the leaves of these trees and of double ringed and control trees indicated that there was considerable movement of solutes through the remaining spiral. In the case of trees fertilized with nitrogen the branches immediately above the end of the spiral cut showed a shortage of nitrogen, while those not so impeded apparently had an ample supply. There was found a very high correlation between nitrogen content and catalase activity in the leaves. Apparently lateral transfer of solutes and other substances was relatively slow but did occur when forced by spiral ringing. It was obvious that assimilated foods from above and nutrient salts from the roots tended to move in straight lines parallel to the long axes of the vascular elements. That the phloem is the more important tissue in translocation was evident in the fact that the removal of the outer xylem did not increase the harmful effects of ringing beyond those of phloem removal alone.

The conducting tissues formed by the cambium subsequent to ringing paralleled the spiral and were soon fully effective in nourishing the tree. Following ringing, structural changes providing for more rapid lateral conduction were soon apparent, the first formed vessel elements being connected through their radial walls, but after the cambium had changed its orientation openings occurred through the end walls. Cambium apparently changed orientation quite easily up to an angle of 90°, with serious difficulty beyond this point. Whether electrical polarity or movement of foods is the controlling factor in cambium orientation is questioned. The general conceptions that lateral con-

duction of food and nutrients is slow, that these substances tend to move in straight lines paralleling the long axes of the vascular elements, and that cambial growth is a response to the coming together of certain nutrients are substantiated.

Varieties of peaches, J. C. C. Price (*Mississippi Sta. Bul. 284 (1930), pp. 16, figs. 7*).—Records are presented on the time of blooming and ripening, yield, resistance to disease, drought, and winter injury, and quality, value, and use of the fruit of 33 varieties of peaches, some of them new seedlings described for the first time.

Grape varieties, J. C. C. Price (*Mississippi Sta. Bul. 281 (1930), pp. 20, figs. 8*).—The results are presented of a variety test which included 71 different grapes.

FORESTRY

[Forestry at the Montana Station], W. E. Pollinger (*Montana Sta. Rpt. 1929, pp. 56–59, figs. 5*).—A splendid growth of trees and shrubs at the Huntley Substation is recorded, while at the Judith Basin Substation a shelter belt held the drifting snow, thus protecting the buildings and conserving moisture for the adjacent gardens. Caragana, boxelder, green ash, and American elm proved valuable species, with poplars and willows less desirable. Culture and pruning of shelter belt trees are recommended.

Forest plantation notes, J. A. Cope (*Jour. Forestry, 28 (1930), No. 5, pp. 765–767*).—Observations in March, 1930, in a plantation of eleven species of conifers established in the spring of 1925 in Oswego County, N. Y., showed only two species, red pine and European larch, to be doing well. Stunting, such as might be caused by severe frost, was noted on Norway and white spruce, Douglas fir, and balsam fir.

***Pinus thunbergii* on Nantucket,** B. Jones (*Natl. Hort. Mag., 9 (1930), No. 4, pp. 180–190, figs. 10*).—Of a number of exotic conifers tested, *P. thunbergii* obtained from northern Japan was alone found able to withstand the adverse conditions of this wind-swept island.

Depth of planting experiments with Scotch pine [trans. title], A. Dengler (*Ztschr. Forst u. Jagdw., 62 (1930), No. 7–8, pp. 447–465, figs. 9*).—Experiments conducted by the Möller Forestry Institute in the Chorin Forest concerning the influence of different planting depths upon the growth of 1-year-old Scotch pines led to the conclusion that depth of planting was not of prime importance. There was noted a loss of from 5 to 10 per cent of the plants in the deeply set lot, but this is not considered of particular practical significance. The height development up to 8 years of age was practically the same in the two lots, and root development was not significantly different.

Influence of summer temperature on the seed germination of Norway spruce [trans. title], E. Eide (*Meddel. Norske Skogforsøksv., No. 13 (1930), pp. 473–508, figs. 8; Eng. abs., pp. 505, 506*).—The occurrence of low summer temperatures following a profuse spring bloom of Norway spruce was taken by the Norwegian Institute of Experimental Forestry as a favorable opportunity for studying the relation between summer temperatures and the quality of the seed. No viable seed developed in regions where the average summer temperature fell below 9° C. (48.2° F.). Above 9° viability increased rapidly, attaining 80 per cent at 10°. Summer temperature had a marked influence on the length of cones, r being +0.88, with r between length of cone and viability +0.54. The percentage of viable seeds was lowest near the coast, apparently due to earlier flowering during a very unfavorable period of weather.

Quantity and nutrient contents of pine leaf litter, F. J. Alway and R. Zon (*Jour. Forestry, 28 (1930), No. 5, pp. 715–727*).—In a joint project conducted by

the Minnesota Experiment Station and the U. S. D. A. Forest Service measurements were made of the quantity of litter accumulating under unthinned stands of pines on sandy soil of low productivity. The average fall of litter in 12 months amounted to 1,738 lbs. per acre on an oven-dry basis. The amount of litter varied as much as 25 per cent from plat to plat in a single year and almost as much on the same plat from one year to the next. Analyses of the litter showed in the average 12 months' accumulation 11.2 lbs. of nitrogen, 17.2 lbs. of calcium oxide, 2.6 lbs. of potassium oxide, 2.2 lbs. of P_2O_5, and 3.4 lbs. of SO_3, the total equivalent in value to $2.30 worth of commercial fertilizer containing the same quantities of nutrients. Destruction of the litter by fire was estimated to cause a loss of 90 per cent of the fertilizing value of the litter.

A study of the relation between actual and normal yields of immature Douglas fir forests, W. H. MEYER (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 9, pp. 635–665, figs. 8*).—Field studies by the Pacific Northwest Forest Experiment Station in understocked and overstocked Douglas fir stands indicated that in order to arrive at the real acreage of any type the areas of all large openings should be mapped and eliminated from computation. Small gaps and holes, such as are caused by gullies, creeks, and included hardwoods, usually averaged not over 10 per cent of the total area and were not deducted. Based on the results of strip surveys in 83 tracts, second-growth stands of Douglas fir, excluding the major openings and gaps, were found to approximate slightly better than 80 per cent of the normal yield table values.

Total number of trees was found a very unsatisfactory index of total volume stocking, the basal area being the most reliable index of volumes in cubic feet and board feet by the International rule. For board-foot volume by the Scribner rule the number of trees 12 in. or more in diameter at breast height was more reliable. An advance was estimated of understocked stands to a more fully stocked or normal condition at the approximate rate of 4 per cent each decade for stands between 40 and 80 years of age. The highest volumes are obtained on approximately 40 per cent slopes referenced to horizontally measured acre sites. North and east aspects were the more favorable, but site apparently had no effect on the average degree of stocking. Strip sampling with proper control of width is deemed more reliable than plat sampling, but the relations between pairs of stand factors, such as basal area, cubic-foot volume, and board-foot volume, are considered much alike, whether determined by strip surveys or sample plats.

Distribution and amount of moisture in virgin redwood trees, R. F. LUXFORD (*Jour. Forestry, 28* (*1930*), *No. 5, pp. 770–772, figs. 2*).—Estimating the large quantity of water in living redwood trees, a study was conducted by the Forest Products Laboratory to determine the location of this water. The section nearest the ground was high in moisture throughout the cross section, while higher up the pith was lower in water than farther out. Moisture was extremely high in the sapwood throughout the whole tree, averaging over 200 per cent of the dry weight of the wood. Moisture in the heartwood was highest at the base of the tree, gradually decreasing up to a height of 80 ft. and thereafter practically constant. Butt logs as a result of their higher water content are more difficult to dry than upper logs and should be handled separately.

Bark characteristics as an index of the density of redwood, R. F. LUXFORD (*Jour. Forestry, 28* (*1930*), *No. 5, p. 772*).—A possible correlation was observed between the character of the bark and the density of redwood. Trees with interlaced bark apparently contained the densest and consequently the strongest wood, more so than did spiral grained or straight fissured bark trees.

The formation of chambered pith in the twigs of butternut and black walnut, W. M. Harlow (*Jour. Forestry, 28 (1930), No. 5, pp. 739–741, figs. 5*).—Finding that chambering or diaphragming of the pith of butternut and black walnut did not take place until twig elongation had practically ceased, the author considers the phenomenon is not the result of the rupture of the tissue concomitant with elongation but rather some process associated with leaf fall, perhaps a loss of moisture and chemical changes.

DISEASES OF PLANTS

Host index of the fungi of North America, compiled by A. B. Seymour (*Cambridge: Harvard Univ. Press, 1929, pp. XIII+732*).—This appears to be considered as a second edition of the host index of fungi issued about 40 years previously as the result of collaboration by Farlow and Seymour (E. S. R., 3, p. 810).

"The primary object of this work is to indicate so far as recorded in the literature, for each host plant, all the fungi known to grow upon it and for each fungus all the hosts upon which it grows. . . .

"Our geographical area includes the whole of North America and neighboring islands from Trinidad and Panama to the northern limits of plant life from Greenland to Alaska. From this area, we include all publications containing parasitic fungi which a diligent search of more than 50 years has brought to light. . . .

"The genera of host plants are arranged as nearly as may be in the sequence indicated by Engler & Prantl, Die Natürlichen Pflanzenfamilien, the seed plants being interpreted by Dalla Torre & Harms, Genera Siphonogamarum. The arrangement of the algal hosts is contributed by N. L. Gardner. Species are alphabetically arranged in each genus. . . .

"The naming of host plants is much more difficult than for the first edition. . . . In the present index we have attempted to apply the International Rules of Nomenclature and to profit by special monographs."

Plans, difficulties, and changes are outlined, and an index is supplied.

Insect and fungus pests of the farm, J. C. F. Fryer and F. T. Brooks (*London: Ernest Benn, 1928, pp. 198*).—"The volumes in this series are intended to place at the disposal of practical farmers and those who intend to take up agriculture as a profession a summary of the broad scientific principles governing farming on a business basis, and, at the same time, to embody such notes as are necessary to enable these principles to be applied from day to day."

The authors discuss from the farming standpoint some of the difficulties due to plant pests and diseases which must be faced on the average farm.

Joint discussion on the control of plant diseases (*Ann. Appl. Biol., 14 (1927), No. 4, pp. 544–563*).—In the joint session of the sections of botany and agriculture of the British Association for the Advancement of Science, held at Leeds, September 2, 1927, N. L. Alcock and W. B. Brierley discussed methods of the control of plant diseases.

Report of the section of botany (*Michigan Sta. Rpt. 1928, pp. 172–175*).—Work carried on by G. H. Coons and M. C. Carpenter upon the growth of approximately 100 species of Fusarium on various concentrations of aniline dye indicated that the reactions were specific and should yield a ready means of identification for many species. Some success was obtained in immunizing animals with antigens prepared from the Fusaria.

Studies by R. Nelson on the etiology of pea bean mosaic showed a constant difference in the cell contents of diseased and healthy plants.

As determined by J. E. Kotila, thorough inspection and adequate isolation are important factors in the production of virus-free potato stocks. Certain of the organic mercury compounds were not as effective as standard treatments for the control of tuber-borne diseases. Several distinct strains of Rhizoctonia were isolated from the potato, and a new species capable of forming its perfect stage in pure cultures was obtained from alfalfa.

Studies by C. W. Bennett of raspberry virus diseases led to their classification into five major groups designated as curl, rugose, mosaic, yellow mosaic, and mild mosaic. Minor but apparently constant variations of these and of the eastern bluestem form apparently occur.

Comparisons by Coons of dusts and sprays for controlling celery leaf spot showed that dusts have distinct promise. The M. S. C. strain of Golden Self Blanching celery showed satisfactory resistance to the yellows disease and is deemed promising for soils infested with Fusaria.

[Plant pathology at the Montana Station], C. McKEE, H. E. MORRIS, ET AL. (*Montana Sta. Rpt. 1929, pp. 29, 30, 82–84*).—On a basis of two years' results, the conclusion is reached that thorough treatment of wheat seed, together with planting before September 1, will do much to control smut. Montana No. 36 winter wheat inoculated with smut and treated with 52 per cent copper carbonate and seeded at 10-day intervals, from August 1 to September 1, averaged 1.1 per cent of smut as compared with 11.4 per cent for inoculated but untreated seed. When seeded at 10-day intervals, from September 1 to October 1, the infection reached 8.7 per cent in the treated and 56 per cent for inoculated untreated seed. There was little difference between treatments with copper carbonate, copper sulfate, and formaldehyde. Hydrated lime applied as a dry treatment was not effective in the control of stinking smut. Seeding wheat in furrows similar to those made by a furrow drill did not lower the amount of smut infection.

Work in the breeding of wheats possessing resistance to stinking smut (*Tilletia laevis*) progressed to the extent of testing several hundred varieties, among which several were found which gave very low percentages of infection from inoculated seed, but unfortunately were lacking in other qualities. Only two spring wheats were found with a high degree of resistance. The several physiologic forms of stinking smut complicated the problem of breeding resistant varieties. The study had not progressed far enough to yield concrete results.

A total of 435 parasitic diseases, 29 virus diseases, and 34 nonparasitic diseases were found on 95 species and varieties of plants. About 87 diseases of plants were recorded for the first time. Certain potentially serious troubles, such as bean anthracnose and cherry brown spot, were not able to thrive in Montana, although introduced more than once. The following troubles are briefly discussed in relation to their harmfulness and their control: Stinking smut of wheat, foot rot of cereals, black stem rust of cereals, loose smut of wheat, alfalfa leaf spots, barley smuts, potato degeneration diseases, apple scab, bean blight, bean mosaic, and bean root rot.

Plant pathology, [Trinidad and Tobago], F. STELL (*Trinidad and Tobago Dept. Agr. Rpt. 1928, pp. 49–51*).—Cacao witches' broom disease (*Marasmius perniciosus*) was discovered (though in mild degree) in L'Ebranche Valley in South Manzanilla and in the district between Gualco and Tamana. The higher humidity along streams appears to favor the disease. Cacao black pod (*Phytophthora* sp.) causes much damage in some years. The cultural method (agricultural adjustment) is regarded as the more practical. Root disease, due to *Rosellinia* sp. and *Sphaerostilbe* sp., still causes some loss of trees.

Sugarcane mosaic has existed in the Northern sugarcane belt for about 10 years and in the Couva belt for about two years. Soundness in the cuttings is the best safeguard.

Coconut wilt is important, though almost entirely confined to soils of high clay content. Red ring is still fairly prevalent. Isolation trenching is the most important control measure. Little leaf and bleeding stem are not very important.

Coffee thread-blight (*Pellicularia koleroga*) was particularly bad during the year, especially in old neglected bushes. Spraying should be preceded by such sanitary measures as spacing and pruning. *Omphalia flavida* is also best controlled by ventilation. Nematode affection in the roots is said to be sporadic and not of economic importance unless the bushes have become debilitated. The Sclerotium which attacks coffee of the Liberian group is threatening only in case of shade and high rainfall.

Research work, [plant diseases], E. S. SALMON and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 26 (1929), pp. 168–172*).—In this portion of the reports from the mycological department it is stated that investigations have been carried on in connection with hop downy mildew (*Pseudoperonospora humuli*), hop interspecific grafting in relation with mosaic, small hop disease, nettle downy mildew (*P. urticae* and *Peronospora debaryi*), possibly related to hop downy mildew, and spraying against apple scab.

Report of the imperial mycologist, W. MCRAE (*Agr. Research Inst., Pusa, Sci. Rpts. 1927–28, pp. 56–70*).—This report, in detailed and tabular form, covers diseases of plants, systematic work, the program of work for 1928–29, and the publications issued. The diseases of the agricultural plants reported include rahar (*Cajanus indicus*) wilt (*Fusarium vasinfectum*), sugarcane mosaic, cotton and sesame wilt (*F. vasinfectum*), *Piper betle* wilt, cinchona seedling infection (*Phytophthora* sp.) *Cicer arietinum* leaf disease (*Mystrosporium* sp.), *Sesamum indicum* malformation and proliferation (*Sclerotium bataticolum*?), rice grain sterility (*Fusarium* sp.? or *Cephalosporium* sp. ?), kodra (*Paspalum scrobiculatum*) smut (*Sorosporium paspali*), and wheat rust.

Report on the mycological section, F. C. DEIGHTON (*Sierra Leone Lands and Forests Dept. Ann. Rpt. 1928, pp. 14–19*).—Brief notes are given regarding diseases affecting economic plants in considerable number and variety, and a few wild plants, with records of other fungi named.

Work of the division of pathology, [Queensland], A. F. BELL (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 28 (1927–28), pp. 10–13*).—The present account, following up those previously presented by Wood as in part previously noted (E. S. R., 60, pp. 549, 838; 61, p. 844), includes information regarding sugar cane Fiji disease, gumming, mosaic, leaf scald, and diseases classed as secondary in importance, including downy mildew, top rot, spindle top, red rot, ill-defined rots of the stem, and parasitic root rots.

Fungi affecting graminaceous plants of the Gold Coast, R. H. BUNTING (*Gold Coast Dept. Agr. Bul. 10 (1927), pp. 51+III, pls. 11*).—"This bulletin is at once a review of the fungi known up to date to occur on the cultivated and uncultivated grasses of this country and a guide to probably effective methods of controlling the diseases caused by these fungi. . . .

"It is probable that certain of the fungi described herein are new to science, while, in other cases, occurrences on certain crops are recorded here for the first time. . . .

"Two methods of treatment are suggested which should be noted by agricultural officers—namely, the effect of rotation or alternation of crops on the recurrence of certain diseases, and the probable value of seed-sterilization as a means of reducing the incidence of certain diseases."

Stem rust of wheat: The isolation of resistant types from a Federation×Khapli cross, H. J. HYNES (*Agr. Gaz. N. S. Wales, 39 (1928), No. 12, pp. 871–880, figs. 4*).—Stem rust under Australian conditions is not considered a major cereal disease, notwithstanding the fact that serious damage may be caused in certain seasons when rust develops extensively on the upper portion of the stems during the grain-filling period. Recent losses are very briefly indicated. Barberry bushes are rare to unknown in Australia, and the teleutospores in most sections of the wheat belt appear to have lost the power of germination by the end of the summer. All sources of rust infections under local conditions can be traced directly to the uredospores which overwinter on volunteer wheats.

The causal fungus of stem rust of cereals is *Puccinia graminis*. The strain which occurs on wheat, *P. graminis tritici*, will also attack barley and certain grasses, but not oats, which are, however, attacked by their own specialized strain, as also are rye and grasses severally. Studies extending over several years are outlined.

In 1921 a successful cross was made between Federation wheat (*Triticum vulgare*) and Khapli emmer (*T. dicoccum*). A study was made of plant types, fertility, and stem-rust reaction in the hybrids at the Minnesota Experiment Station in 1924-25. The most promising families in the F_4 generation were subsequently investigated for their agronomic qualities and reaction to form 1 of Australian stem rust at the Cowra Experiment Farm. Of 394 F_5 families tested, 9 appeared completely resistant and showed desirable field characters.

In the F_6 generation, 549 families were studied for their agronomic qualities and reaction to forms 1 and 2 of Australian stem rust. Of these 16 families showed a large number of individuals resistant to both forms of rust, and of these 7 showed promising agronomic characters.

It is regarded as significant that 4 F_6 families were isolated which were completely resistant as regards both forms of stem rust tested, and these showed fixity as regards agronomic qualities which were considered as promising.

The influence of Tilletia tritici (Bjerk.) Wint. and Tilletia laevis Kühn on the growth of certain wheat varieties, K. SAMPSON and D. W. DAVIES (*Ann. Appl. Biol., 14 (1927), No. 1, pp. 83–104, pls. 2, fig. 1*).—It is claimed that bunt has shown a distinct influence on vegetative organs of the plant besides the well-known effect on the grain. Both *T. tritici* and *T. laevis* were included in one experiment only, from which it appears that the influence of *T. laevis* was distinctly weaker than that of *T. tritici*, though tending in the same direction. Concerning *T. tritici*, conclusions are detailed separately relating to soil germination and establishment, early growth, tillering, length of straw at maturity, length of ripe ear, and root development.

The incidence and intensity of Puccinia glumarum Eriks. and Henn., on wheat infected and non-infected with Tilletia tritici Winter, showing an apparent relationship between the susceptibility of wheat plants to yellow rust and to bunt, W. A. R. D. WESTON (*Ann. Appl. Biol., 14 (1927), No. 1, pp. 105–112, fig. 1*).—In the season 1925–26 a relationship was observed between wheat yellow rust, *P. glumarum*, and wheat stinking smut, *T. tritici*, inasmuch as bunted Little Joss wheat plants were badly rusted and plants free from bunt were free or comparatively free from rust. The same was true of other wheat varieties.

It is suggested that rust resistance which can not be broken down artificially may be broken down by natural contamination of wheat with the bunt fungus.

On forms of the hop resistant to mildew (Sphaerotheca humuli (DC.) Burr).—VI, Loss temporary of immunity, E. S. SALMON (*Ann. Appl. Biol., 14 (1927), No. 3, pp. 263–275*).—Three varieties of hops previously resistant to

S. humuli (E. S. R., 48, p. 546) became slightly infected in the greenhouse in the spring of 1926. This condition was shown to be temporary, all the infected plants acquiring again during May and June their power of complete resistance. The conidia produced on an immune plant were unable to infect that plant, although able to infect a susceptible variety. It is supposed that abnormal weather conditions, possibly low temperature, brought about the temporary susceptibility.

Grafting experiments with varieties of hops resistant to the hop powdery mildew, Sphaerotheca humuli (DC.) Burr, E. S. SALMON and W. M. WARE (*Ann. Appl. Biol., 14 (1927), No. 3, pp. 276–289, pl. 1*).—These experiments constitute an attempt to extend the work of Roach (E. S. R., 52, p. 148), who has successfully used this method for the investigation of the problem of potato immunity against wart disease, *Synchytrium endobioticum*.

Twenty composite plants were built up by grafting either an immune variety of hop on a susceptible stock, or vice versa. Inoculation of young leaves of the scion, after considerable growth subsequent to grafting, showed that no change had been effected in the varietal immunity or susceptibility in relation to *Sphaerotheca humuli*.

From the results obtained it is considered improbable that immunity or susceptibility to *S. humuli* is connected with any translocatable substance in the hop plant.

The transmission of "mosaic" disease in hops by means of grafting, T. C. THRUPP (*Ann. Appl. Biol., 14 (1927), No. 2, pp. 175–180, pl. 1*).—From April to July, 1926, grafting was employed in the investigations described in the present paper to determine whether mosaic could be transmitted by grafting, also to investigate reports received in 1922 that a new hop variety, M 45, bred at Wye and free from mosaic symptoms itself, appeared to be acting as a carrier of mosaic to neighboring hops of commercial varieties.

In these experiments, where susceptible scions were grafted on mosaic stock, all, with one exception, developed mosaic symptoms.

With the carrier experiments, all the known susceptible scions which were grafted to the carrier M 45 stock showed mosaic symptoms. The variety M 45 is therefore regarded as capable of transmitting the disease to susceptible hops, and as being a carrier. No evidence was obtained that grafting can of itself induce mosaic symptoms in healthy susceptible hops, or in the carrier M 45.

A preliminary report on experiments in the control of grain smut of jowar (Andropogon sorghum), B. N. UPPAL and J. S. MALELU (*Agr. Jour. India, 23 (1928), No. 6, pp. 471, 472*).—Of cultivated crops in the Bombay Presidency, jowar (*A. sorghum*) stands first as regards acreage (over 8,000,000 acres). The most important disease economically of this crop is the grain smut due to *Sphacelotheca sorghi*. Though the 2 per cent copper sulfate solution steeping treatment (10 to 15 minutes) is effective, it wets the grain, and this necessitates drying before sowing. Consequently, some prefer to take a risk and sow without steeping. With a view to encouraging the use of the more convenient method of seed dusting, experimentation was carried out with seed divided into eight lots, which were inoculated with different quantities of smut spores, the dosage ranging by weight from 1:3,000 to 1:250. The heaviest load practically blackened the seed and caused much severer infection than that occurring naturally. The lightest gave only a few hundred spores per seed and was barely perceptible.

Of the dust fungicides used, copper carbonate was most effective, from 2 to 4 oz. of the dust for 60 lbs. of seed controlling infection in the case of every

spore loading except the heaviest (1:250), in which case there was slight infection. In the case of sulfur, fineness of the particles does not seem to give any advantage except better distribution. Sulfur at 4 oz. per 60 lbs. of seed was effective, except in the case of the 1:250 spore loading. Three oz. of sulfur No. 1 controlled smut reliably in spore dosages of 1:750 or less, but less reliably in the case of larger smut dosages. The details as given show that the present system of soaking jowar seed for sowing to prevent grain smut can be replaced by a system of dusting. "Sulfur . . . shows great promise as it is equal to copper sulfate steeping in effectiveness, and is easier to apply and much cheaper than the latter or any of the dust fungicides used."

Mangel scab: Its cause and histogeny, W. A. Millard and F. Beeley (*Ann. Appl. Biol., 14 (1927), No. 3, pp. 296–311, pls. 4, fig. 1*).—Mangel scab, the causation of which has been considered identical with that of common scab of potatoes, is still thought to be closely associated with that disease.

The present work is claimed to show that mangel scab is of two distinct types, raised and pitted, and that the raised type may be further subdivided into two which are called mound and knob scab, respectively. The latter types appear to develop more commonly on the yellow-skinned varieties and show on investigation of their development and structure a striking difference in their origin. Details are given.

Blemishes and discolorations of market onions, G. B. Ramsey (*U. S. Dept. Agr. Circ. 135 (1930), pp. 4, fig. 1*).—Injuries to onions caused by various agencies, such as chemicals in the fabric of the bags, exposure to ammonia fumes, or intense sunlight, are described and discussed, and reference is made to an undescribed disease of California-grown Bermuda onions due to a species of Macrosporium which discolors the outer surface by the development of a dark-colored fungus between the dry outer scales but does not actually cause any decay.

Early manifestations of potato blight (Phytophthora infestans De Bary), N. L. Alcock and A. E. S. McIntosh (*Ann. Appl. Biol., 14 (1927), No. 4, pp. 440, 441, pl. 1*).—During February, 1927, potato tubers sprouted indoors in the laboratory of the Seed Testing Station, East Craigs, produced short diseased shoots showing presumably primary infection of *P. infestans*. At the end of the month supposed cases of secondary infection occurred.

Observations on the insect carriers of mosaic disease of the potato, K. M. Smith (*Ann. Appl. Biol., 14 (1927), No. 1, pp. 113–131, pls. 3, fig. 1*).—Preliminary experiments were carried out for three or four years before the end of 1925 with insects as transmitters of potato mosaic. The various types of insect-proof cages used are described.

Successful transmission of mosaic was obtained in 1925 with the aphids *Myzus persicae* and *Macrosiphum gei* (*M. solanifolii*). Some evidence of infection was gained by the use of *Asterochiton vaporariorum* (greenhouse white fly) and the leafhoppers *Zygina pallidifrons* and *Eupteryx auratus*. The capsid bugs *Lygus pabulinus* and *Calocoris bipunctatus* failed to transmit the disease.

Antagonism of micro-organisms as the controlling factor in the inhibition of scab by green-manuring, W. A. Millard and C. B. Taylor (*Ann. Appl. Biol., 14 (1927), No. 2, pp. 202–216, pls. 3*).—Criticism is offered regarding the sufficiency of the preferential food theory upheld by Millard and Burr (E. S. R., 60, p. 447) as explanatory of the part played by green manuring in potato scab control, and experiments are described in which potatoes were grown in series of pots containing soil only or soil with grass cuttings, the pots in each series being inoculated with *Actinomyces scabies*, a virulent scab producer, and

with *A. praecox*, an obligate and prolific saprophyte. In the absence of the saprophytic species, grass alone gave no inhibitory action on scab. A reduction of scab was obtained in all pots of soil or soil with grass to which *A. praecox* had been added. This reduction was most marked in the case of the maximum inoculation with *A. praecox*.

The inhibitory effect found of *A. praecox* on *A. scabies* is not due to the setting up of an unfavorable soil reaction, but it is supposedly caused by a starving out of the weaker organism in competition for the available food supply. It is suggested that the beneficial effect of green manuring on scab under field conditions is due to similar competitive action, and that in this competition the bacteria as well as the Actinomyces may play a part. The cases in which green manuring apparently has failed to inhibit scab have been considered from this fresh point of view.

The organic mercury compounds for the control of scab and Rhizoctonia of potatoes, B. A. Brown (*Connecticut Storrs Sta. Bul. 164 (1930), pp. 83–106*).—Utilizing as a cultural area pasture land which had not been plowed for more than 50 years, 12 different treatments for scab and 18 for Rhizoctonia were tested in 1927 and 1928, following preliminary inconclusive tests in 1926 on infected soil. Very little, if any, differences were detected in the germination and vine growth of the various lots of plants. Grouping the yields of the corrosive sublimate and hot and cold formalin plats, and also those of the several organic mercury compounds, the average yields were slightly higher for the old standard treatments in both the scab and Rhizoctonia groups. Classifying the harvested tubers in respect to infection as (1) none, (2) little, (3) considerable, and (4) badly infected, the hot formalin and corrosive sublimate treatments gave the best and practically equal control of scab, whereas corrosive sublimate was clearly the best treatment for Rhizoctonia. The cold formalin treatment was very ineffective in scab control. Presprinkling the seed tubers three days before treatment did not increase the effectiveness of corrosive sublimate in the control of either scab or Rhizoctonia, nor that of cold formalin for scab control.

Sulphur treatment of soil and the control of wart disease of potatoes in pot experiments, E. M. Crowther, M. D. Glynne, and W. A. Roach (*Ann. Appl. Biol., 14 (1927), No. 4, pp. 422–427, fig. 1*).—Evidence from field experiments has already indicated (E. S. R., 55, p. 653) that the toxic action of potato wart disease is not a simple function of the final soil reaction, and pot experiments which were planned to discriminate between two possible modes of action of sulfur failed owing to the absence of infection. These experiments have now been carried out and have afforded further evidence in support of the hypothesis of a dual mechanism of sulfur toxicity. Treatments with sulfuric acid and combinations of sulfur and calcium carbonate yielding a wide range of soil reaction gave almost complete freedom from infection when the acidity of the soil was pH 3.4 or less. Heavy dressings of calcium carbonate, alone or with sulfur, giving a soil reaction of pH 7.5 or more, also reduced infection.

Support is lent to the tentative conclusion that sulfur in controlling wart disease does not depend entirely on raising the acidity but that it has also some other mode of action.

Immunity of potato varieties from attack by the wart disease fungus, Synchytrium endobioticum (Schilb.) Perc., W. A. Roach (*Ann. Appl. Biol., 14 (1927), No. 2, pp. 181–192, pls. 2*).—It is known that certain chemical substances pass freely between stock and scion in grafted plants, either with or without chemical change. Grafting offers, therefore, a means for determining whether a given plant character, as immunity, is innate in the cell

or conditioned by substances which travel freely about the plant. If the character is of the second kind the contributions of the various tissue systems, roots, and foliage may be determined. The present paper describes an attempt to investigate, by grafting, the general nature of the immunity of certain potato varieties from attack by the wart disease fungus, *S. endobioticum*, the potato plant being considered for this purpose as comprising the root system (supplying mineral salts and water); the shoot system (the photosynthetic unit); and the tuber (storage unit). The problem amounts to building up, by grafting, composite plants of all possible types, and testing the tubers for any resulting effect with regard to immunity from the disease or susceptibility thereto in the eight possible types indicated.

In none of the experiments was the reaction of the tubers toward wart disease seen to be changed. It is concluded that the cause of immunity is not carried by any chemical compound which traverses the plant. This conclusion narrows the problem considerably by the elimination of unlikely lines of attack.

It is suggested that the examination of the proteins from immune and susceptible varieties by immunochemical methods is the most hopeful line of attack for the future.

Some pathological effects of the mosaic disease of sugar cane, J. A. Faris (*Planter and Sugar Manfr., 82 (1929), No. 21, pp. 404, 405*).—This brief account of studies on mosaic of sugarcane explains the more rapid drying out in mosaic than in healthy canes as due to the dwarfing of the root system, and the yield reduction in these canes as due largely to the poorer tillering of the mosaic stools. In prolonged drought, mosaic infection is a serious disadvantage.

Prevention of late blight of tomatoes, J. L. Hewitt (*Calif. Dept. Agr. Mo. Bul., 18 (1929), No. 8, pp. 453, 454*).—A brief account of tomato late blight and of its control by preventive spraying includes the life history, spread in the summer and the fall, and sprayings in the summer and the autumn with 4-4-50 Bordeaux mixture.

Rhizoctonia "foot-rot" of the tomato, T. Small (*Ann. Appl. Biol., 14 (1927), No. 3, pp. 290–295*).—An investigation of a foot rot of young tomato plants from Guernsey due to *R. solani* showed the disease to be least prevalent on dry open soils and most severe at temperatures from 16 to 20° C. (60.8 to 68° F.).

Infection was increased by stable manure, slightly decreased by ammonium sulfate, and apparently unaffected by lime, potash, and phosphate manures. Control measures are suggested. During the season the disease was checked by Uspulun, but sterilization of the soil by heat was the most effective and reliable means of control.

The control of apple scab, W. Goodwin, E. S. Salmon, and W. M. Ware (*Jour. Southeast. Agr. Col., Wye, Kent, No. 26 (1929), pp. 34–46*).—In the years 1927 and 1928, during tests of similar plats of trees of Allington Pippin and Newton Wonder sprayed three times with Bordeaux mixture made, respectively, with hydrated lime and with quick lime, the fungicides are said to have proved to be satisfactory. No appreciable leaf scorch was caused. Fruit russeting was appreciable in 3.1 to 3.7 per cent in Allington Pippin and 0.14 to 0.28 per cent in Newton Wonder.

In the same years, plats of Worcester Pearmain trees were sprayed two and three times, respectively, with homemade Bordeaux mixture or Bordeaux paste (Bordorite). In 1927, the percentages of scab-free apples in the Bordeaux mixture plats were 61 and 55; in the Bordeaux paste plats, 29 and

24; and in the unsprayed plats, 39 and 22. In 1928, the percentages of scab-free apples in the Bordeaux mixture plats were 3 and 3; and in the other four plats, 0. Three applications, including one at the pink bud stage, secured no better control than two applications. In 1927, no early infection of the opening leaves occurred, though in 1928 a general infection of these leaves occurred before the first spraying. The failure to control the disease in 1928 is attributed to early and continued infections by winter spores on dead leaves of the previous season.

The strawberry disease in Lanarkshire, C. W. Wardlaw (*Ann. Appl. Biol., 14 (1927), No. 2, pp. 197–201*).—In this account, summarzing the results of field observations and experimental work, it is first pointed out that the Lanarkshire strawberry disease may not be the same as the disease in England. The variety John Ruskin, cultivated over a considerable area, has been most affected.

In the field two aspects of the disease have been apparent, the devastation of square yards of strawberry beds and the obvions diseased condition of individual plants. Soil conditions are unfavorable to the development of an extensive and healthy root system, and roots of all kinds were found to be penetrated by fungal hyphae and to have hyphae associated with them. Eighteen separate fungi were found, and in 12 instances a species of Pythium was the only fungus obtained. This, when inoculated into pots in which strawberry plants had been grown under sterile conditions, attacked both young and old roots, producing all the symptoms of the disease. The Pythium was reisolated in the laboratory from inoculated plants, and this evidence demonstrated that it produces the strawherry disease under field conditions.

It is concluded that Pythium is an important factor affecting the root system on which the general health of the plant depends, though the main factor involved appears to be the general health of the plant.

Experimental work on the soil is being carried out side by side with the mycological studies.

First report on the coffee top-disease in the Residences Benkulen and Palembang (Sumatra) [trans. title], W. Bally (*Arch. Koffiecult. Nederland. Indië, 2 (1928), No. 2, pp. 53–132, figs. 55; Eng. abs., pp. 96–98*).—Information, including a description, is given as to a supposedly hitherto unknown coffee disease which was observed in place for two months. No external condition has been connected with the disease.

The trouble is apparent first as a top die-back producing asymmetry in the tree. In young trees the die-back reaches the collar. A symptom present in the diseased wood from the first is the filling of the tracheae with fungus hyphae.

Examination of the diseased wood showed the presence of fungi, including *Pestalozzia versicolor*, *Gloeosporium* sp., *Cladosporium herbarum*, *Acrostalagmus cinnabarinus* (=*Verticillium latiritium*), and *Diplodia* sp., but none of these has yet been shown to cause the disease, the economic significance and means of control of which are also undetermined. Apparently *Coffea arabica* is more resistant than is *C. robusta*.

An oak leaf disease caused by Sclerotinia candolleana (Lev.) Fuckel, M. Wilson and J. S. L. Waldie (*Ann. Appl. Biol., 14 (1927), No. 2, pp. 193–196, pl. 1*).—During two years the authors have observed a disease which is described as causing extensive damage to oaks, particularly in northern Britain, but as affecting only the leaves, which on falling rid the tree of the fungus *S. candolleana*. Both *Quercus pedunculata* and *Q. sessiliflora* are affected, as are nursery plants of *Q. rubra*. It is said to have been recorded also on *Castanea sativa* and on *Q. robur*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

American game mammals and birds: A catalogue of books, 1582 to 1925, J. C. Phillips (*Boston: Houghton Mifflin Co., 1930, pp. [7]+639*).—The first part of this work consists of a general catalogue (pp. 11–418); the second part lists works on conservation—general (pp. 419–448), Federal (pp. 449–487), State (pp. 487–561), and Canada (pp. 562–573); and the third part lists periodical publications, pamphlets, etc. (pp. 575–639).

A study of the common rat and its parasites, K. Wu (*Lingnan Sci. Jour., 9 (1930), No. 1–2, pp. 51–64, pl. 1, fig. 1*).—In this paper the author reports upon the results obtained from examinations made of 250 rats caught in the vicinity of Soochow University, Soochow, China. Eleven entozoa were found, namely, *Trypanosoma lewisi*, *Clonorchis sinensis* (Cobbold), *Echinostoma macrorchis* (Ande & Ozadi), *Schistosoma japonicum* (Katsurda), *Notocotylus* sp., *Taenia crassicollis* Rudolphi, *Hymenolepis diminuta* (Rudolphi), *H. nana* (Von Siebold), *Hepaticola hepatica* (Bancroft), *Enterobius vermicularis* (L.), and *Heligmosomum muris* (Yokogawa); and two epizoa, the ordinary rat flea and *Polyplax spinulosa*.

Animal life of Yellowstone National Park, V. Bailey (*Springfield, Ill.: Charles C. Thomas, 1930, pp. [12]+241, pls. 4, figs. 67.*)—Following the introduction (pp. 3–8), the chapters are devoted to life zones of Yellowstone Park (pp. 9–15); mammals of Yellowstone Park (pp. 16–187); birds of Yellowstone Park (pp. 188–228); fish, reptiles, and amphibians (pp. 229, 230); and invertebrates (p. 231).

Fur laws for the season 1930–31, F. G. Grimes (*U. S. Dept. Agr., Farmers' Bul. 1648 (1930), pp. II+30*).—This is the sixteenth annual summary (E. S. R., 62, p. 351), dealing with the fur laws for the season 1930–31.

Some birds of Maryland, T. G. Pearson (*Baltimore: Md. Conserv. Dept., Game Div., 1929, pp. 71, figs. 32*).—In this popular handbook full-page descriptions are given of 32 species, each of which is illustrated by a colored plate, 18 by Horsfall, 6 by Brooks, 6 by Sawyer, and 2 by Fuertes.

On the food of certain owls in east-central Illinois, A. R. Cahn and J. T. Kemp (*Auk, 47 (1930), No. 3, pp. 323–328*).—A brief report is given on the food of the barn owl, short-eared owl, long-eared owl, barred owl, screech owl, and snowy owl, based upon pellets examined.

The woodpeckers of Oklahoma, E. D. Crabb (*Okla. Univ. Biol. Survey Pubs., 2 (1930), No. 3, pp. 111–116*).—Fifteen forms of woodpeckers occurring in Oklahoma are dealt with, including their range, calls, description, habits, food, etc.

Birds of the Netherlands, III, IV, E. D. van Oort (*De Vogels van Nederland. The Hague: Martinus Nijhoff, 1928, vol. 3, pp. VIII+252, pls. 80; 1930, vol. 4, pp. VIII+256, pls. 77*).—This third volume of the work previously noted (E. S. R., 56, p. 754) deals with birds of the additional suborders Limicolae (Appendix) and Lari of the order Charadriiformes, with the orders Columbiformes and Cuculiformes, and with the suborder Striges of the order Coraciiformes. Volume 4 deals with the suborders Caprimulgi, Cypseli, Coraciae, and Pici of the order Coraciiformes and with the suborder Passeres Diacromyodae of the order Passeriformes.

The birds of tropical West Africa, with special reference to those of the Gambia, Sierra Leone, the Gold Coast, and Nigeria, I, D. A. Bannerman (*London: Crown Agents for Colonies, 1930, vol. 1, pp. LXXV+376, pls. 10, figs. [161]*).—A descriptive account, with notes on their feed identification, range and local distribution, and habits. The introductory part includes accounts of the relationship of the vegetation belts to the distribution of bird life in tropical Africa (pp. XXIX–XLV); ornithological history—an account of the principal

field work accomplished in the Gambia, Sierra Leone, Gold Coast, and Nigeria, 1690–1929 (pp. XLVII–LVII); glossary of technical terms (pp. LIX–LXI); method of measurement (p. LXII); and an illustrated key to the birds of tropical West Africa, orders I–VIII (pp. LXIII–LXXV). A bibliography of five pages is included.

The common birds of Bangkok, C. J. Aagaard (*Copenhagen: Chr. Backhausen, 1930, pp. 239, figs. 105*).—This is a practical guide to the birds occurring commonly in the vicinity of Bangkok.

Shanghai birds: A study of bird life in Shanghai and the surrounding districts, E. S. Wilkinson (*Shanghai: North-China Daily News & Herald; London: Arthur Probsthain, 1929, pp. [5]+XXI+243, pls. 24, fig. 1*).—Following the introductory part this work gives brief descriptions of the birds met with in the vicinity of Shanghai, together with colored plates illustrating many.

Bird song, A. A. Saunders (*N. Y. State Mus. Handb. 7 (1929), pp. 5–202, figs. 83.*)—This booklet, issued as one of the handbooks, deals with the subject under the headings of phenomena of bird song (pp. 16–97), purposes of bird song (pp. 98–108), origin and evolution of bird song (pp. 109–131), how to study bird song (pp. 132–176), problems for future study (pp. 177–183), list of species of birds mentioned (pp. 184–187), and a bibliography (pp. 188–193). A subject index is included.

The Plant Quarantine and Control Administration: *Its history, activities, and organization,* G. A. Weber (*Inst. Govt. Research, Serv. Monog. U. S. Govt. No. 59 (1930), pp. X+198*).—Part 1 of this monograph deals with history (pp. 1–92), part 2 with activities (pp. 93–121), and part 3 with organization (pp. 122–128). An outline of organization, a classification of activities, publications, laws, a financial statement, and a bibliography are taken up in appendixes (pp. 129–194).

A manual for the study of insects, J. H. and A. B. Comstock and G. W. Herrick (*Ithaca, N. Y.: Comstock Pub. Co., 1930, 19. ed., rev., pp. XIII+401, pls. 3, figs. 633*).—This nineteenth edition of the work previously noted (E. S. R., 7, p. 147) has been revised by Herrick.

[Contributions on economic insects in California] (*Calif. Dept. Agr. Mo. Bul., 19 (1930), Nos. 6, pp. 389–429, 452–455, 467, figs. 15; 8, pp. 545–587, 588–590, 591–597, figs. 25*).—The contributions here presented of interest to economic entomologists include the following:

No. 6.—The Oil Emulsions, a Brief Survey, by A. C. Browne (pp. 389–408); The Lima Bean Pod-Borer [*Etiella schisticolor* Zell.] in California, by S. E. Flanders (pp. 409–421); Armyworm Invasion (p. 421); Some Notes on the Soluble Sulfurs, by R. P. Tucker (pp. 422–429); Red Spider or Pacific Mite in San Joaquin County, by A. E. Mahoney (pp. 452, 453); A Practical Key to the Species of Termites Found in California, by S. F. Light (pp. 454, 455); and Lesser Bulb Fly Found, by A. E. Morrison (p. 467).

No. 8.—Insects Reported on Trip into Baja California, by R. N. Hutchison (pp. 545, 546); Some Insects Infesting Shade Trees in California and the Problem Involved in Their Control, by D. B. Mackie (pp. 547–556); Experiments with Paris Green in the Control of Termites, by R. H. Smith (pp. 557–560); Characteristics of Some of Our California Soft Scale Insects (Coccidae), by J. B. Steinweden (pp. 561–571); Notes on Some Deciduous Fruit Insects: *Stamoderes uniformis* Casey, a New Deciduous Fruit Insect Pest, by A. D. Borden (pp. 572, 573); New Spider Mite Reported in Tulare, by E. A. McGregor (p. 573); Synopsis of the Dipterous Larvae Found in California Fruits, by H. H. Keifer (pp. 574–581); The Grape Leaf Hopper in California, by S. Lockwood (pp. 582–584); What About Honey Certification? by C. H. Kinsley (pp. 585–587); Progress in the Control of the Grape Mealybug, by P. F. Wright

(pp. 588–590); A Contribution to Our Knowledge of *Brachyrhinus cribricollis*, by A. C. Browne and H. H. Keifer (pp. 591–595); and The Black Widow (*Lactoderes mactans*), by A. C. Browne (pp. 596, 597).

[Contributions on economic insects] (*Peninsula Hort. Soc. [Del.] Trans., 43 (1929), pp. 18–27, 30–33, 39–42, figs. 2*).—The papers presented at the annual meeting (E. S. R., 63, p. 751) of the Peninsula Horticultural Society, held at Easton, Md., in December, 1929, include the following: Some Experiences with the Mexican Bean Beetle in 1929, by E. N. Cory (pp. 18–20); Recent Developments in Oriental Fruit Moth Control, by L. A. Stearns (pp. 20–27); Prevalence of Insects in the Fruit Crop of 1929, by E. N. Cory (pp. 30–33); and Life History Studies of the Plum Curculio in Relation to Fruit Infestation in 1929, by L. L. Williams and H. L. Dozier (pp. 39–42).

[Contributions on economic insects and insect control] (*Ill. State Hort. Soc. Trans., 63 (1929), pp. 139–154, fig. 1, pp. 154–170, 369–379, 383–387, 430–444*).—Contributions here presented are as follows: The Oriental Fruit Moth, Curculio, and Codling Moth in Illinois in 1929, by W. P. Flint (pp. 139–146); Oil Sprays for Late Brood Codling Moth, by M. D. Farrar (pp. 147–154); The Stationary Spray Plant, by D. E. Lewis (pp. 154–170); Insect Control (pp. 369–379) and The Corn Borer Situation (pp. 383–387), both by C. C. Compton; The Oriental Fruit Moth in 1929, by W. P. Flint and S. C. Chandler (pp. 430–441); and Studies of Bait Traps for the Oriental Fruit Moth, by W. P. Yetter, jr. (pp. 441–444).

[Papers on economic insects] (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 14 (1929), pp. 187–213, 341–348, 352–356, 389–393*).—The contributions here reported include the following papers presented at Baltimore, Md., in January, 1930: The Present Status of Our Knowledge of Curculio Control, by O. I. Snapp (pp. 187–206), and San Jose Scale, a Serious Menace—It Must Be Controlled, by E. N. Cory (pp. 206–213), both presented before the Maryland State Horticultural Society; Vegetable Insects of 1929, by E. N. Cory (pp. 389–393), presented before the Maryland Vegetable Growers' Association; and Races of the Honeybee, by W. J. Nolan (pp. 341–348), and Honey as a Disseminator of American Foulbrood Spores, by G. J. Abrams (pp. 352–356), both presented before the Maryland State Beekeepers' Association.

[Report of work in economic entomology], R. H. PETTIT (*Michigan Sta. Rpt. 1928, pp. 188–200*).—Test sprays of several arsenical salts applied during the year in comparison with lead arsenate for control of the grape berry moth are reported upon, the results being presented in tabular form. The results of analyses of arsenates made by O. B. Winter with the view to determining the solubility of various arsenicals in water containing carbon dioxide are presented. A similar inquiry made as to the effect of the same arsenicals on young apple trees is reported on by L. G. Gentner. The application of Sunoco Spray Oil diluted 1 part to 30 parts of water prevented injury by the spruce gall aphid *Chermes abietis*), no injury at all being observed.

The spruce kermes (*Physokermes piceae*) badly infested spruce, but spraying April 24 with Scalecide diluted 1 part to 25 parts of water prevented injury and caused the disappearance of the scale.

The application of Scalecide 1 to 25 parts of water on April 24 against the white pine scale (*Chionaspis pinifoliae*), which insecticide has at other times resulted in a 100 per cent clean-up, gave only about 20 per cent control. It is pointed out that the temperature dropped from 40° F. to below freezing the first night after the application was made.

The application of Dendrol Dormant Spray Oil at the rate of 1 part to 30 parts of water to Norway spruce trees badly infested with *Chermes abietis* resulted in a complete clean-up of the aphid and no permanent injury, though

applied at a time when growth was just starting or was about to start. At the rate of 14 gal. to 100 gal. of water, a strength much stronger than was intended, applied under 225 lbs. pressure to a large quantity of nursery stock at Lansing, it resulted in apparently complete destruction of the elm scale and elm scurfy scale, with no spray injury whatever.

Eight observation stations were maintained during the year for the determination of the dates for optimum results in spraying to control the cherry fruit fly. The black cherry maggot (*Rhagoletis fausta*) was found in considerable numbers for the first time in Michigan.

A brief reference is made to the European red mite (*Paratetranychus pilosus*), which has gradually spread over the State until it is now found throughout the eastern part of the lower peninsula and the southern part of western Michigan.

In tests made by Gentner of a number of oil emulsions and some other sprays with a view to finding some control for the codling moth other than through the use of arsenicals, as high as 62.75 per cent of clean fruit was obtained from a combined nicotine-lime sulfur spray.

Observations by Gentner of the fringe-winged apple bud moth (*Holcocera maligemmella* Murt.), noticed for the first time in Michigan in June, 1927, led to the conclusion that it is not a major pest of apples in the State, even though regarded as such in Missouri.

Applications of the Volck summer oil emulsion by Gentner and W. C. Dutton during the latter part of July and the first part of August at the rate of 1.5 gal. in 100 gal. of water gave a lasting control of the pear psylla, without doing any perceptible injury to the trees. It was found that although some eggs had been laid on the oil-sprayed foliage, most of the nymphs hatching from these eggs died while still young. The trees were kept clean and retained their foliage until the end of the season, and the wood was clean and not smutted. Summer applications of sprays consisting of 1 pint of 40 per cent nicotine sulfate and 50 lbs. of lime for each 100 gal. of water gave an excellent kill of the pear psylla nymphs and adults, although there was a heavy reestablishment of the pest toward the end of the season. In one orchard where 1 lb. of Kayso had been added to a spray similar to that mentioned above, there was a considerable mortality among the young nymphs hatching from the eggs which were on the foliage at the time of application. A comparison between the commercial oil preparations and homemade emulsions applied in March showed excellent control with both types, the oil on the wood preventing egg laying and killing outright many adults on the trees at the time of the applications. Adults flying in after the application gradually disappeared from the trees. No injury from the emulsions was observed.

The elm leaf beetle, which has been established in the southeastern part of the State for several years, continues to spread slowly but surely. The iris borer, an account of which by McDaniel has been noted (E. S. R., 59, p. 456), made its appearance in the State and was quite successfully controlled by the use of a solution of corrosive sublimate applied at the rate of 1 oz. to 8 gal. of water. The lesser bulb fly appeared in the State for the first time during the year. The moth *Endothenia* (*Olethreutes*) *hebesana* was found infesting the seed pods of iris. Vineyards that were attacked by the grape berry moth from 1925 to 1927, inclusive, were almost free from the pest in 1928.

The seed corn maggot, which had caused annoyance by working on the roots of young cucumbers, was reared to adult for the first time. Experiments with solutions of a mercury salt and with emulsions of oils that are used successfully in controlling onion maggots showed that they would prove useless in a practical way in combating the maggot when on cucumber roots.

A new gall-making aphid (*Chermes similis*) which forms galls at the tips of the new growth of Norway spruce, an account of which by McDaniel has been noted (E. S. R., 59, p. 59), was received during the year from Indian River.

A bark beetle, *Pityophthorus ramiperda*, was found tunneling inside the tips of the twigs of the new growth of white pine in association with *P. puberulus* and *P. granulatus*. The trees attacked were not killed outright but were sufficiently disfigured to become quite conspicuous.

The bird tick *Haemaphysalis chordeilis* was received from Benzonia, where it was taken from turkeys that ran in the woods.

Reference is also made to the extensive injury to living cornstalks by termites in Montcalm County during the fall of 1927.

Research in the field of entomology, R. A. Cooley et al. (*Montana Sta. Rpt. 1929, pp. 84–87*).—Of 38 species of mosquitoes found in Montana, 4 are said to make up most of the mosquito fauna of the badly infested districts. In studies of the life histories of these 4 species, 1, *Aedes vexans* Meig., was found to deposit as many as 5,000 eggs. Eggs that were collected in 1928 and stored in sealed glass vials in a refrigerator hatched readily in 1930 when placed at a higher temperature. Eggs that had been allowed to dry out until they were all shriveled hatched on being placed in water. Exposure to a below-zero temperature for long periods had no apparent detrimental effect.

Notes are presented upon the pale western cutworm, considered the most severely destructive insect attacking Montana wheat crops, a report of studies of which by Cook has been noted (E. S. R., 63, p. 159), and upon the army cutworm and their control.

Notes on economic insects on Vancouver Island in 1927, W. Downes (*Ent. Soc. British Columbia Proc., No. 25 (1928), pp. 16–18*).—A brief account of the more important insect pests met with in 1927.

Entomological investigations (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 15 (1929), pp. 54–65*).—Methods in Practical Use for the Control of the More Important Animal Pests of Glasshouse Plants, reported upon by E. R. Speyer (pp. 54–60), is followed by an account of Red Spider Investigations on Commercial Nurseries, by O. B. Orchard (pp. 60–62), and one of Fumigation Experiments with the Red Spider Mite, by W. H. Read (pp. 62–65).

[Report of work in entomology], R. S. Pearson (*[Gt. Brit.] Dept. Sci. and Indus. Research, Forest Prod. Research Bd. Rpt. 1928, pp. 54–60, pls. 2, figs. 2*).—A brief account on Lyctus powder post beetles and furniture beetles, including the common furniture beetle (*Anobium punctatum*) and the death watch beetle (*Xestobium rufo-villosum*), and insecticide tests.

The economic insects of Palestine [trans. title], F. S. Bodenheimer (*Monog. Angew. Ent. No. 10 (1930), pp. XV+438, pl. 1, figs. 144*).—Following an introductory discussion this work deals with the more important insects of Palestine, particularly those occurring in the coastal districts, the arrangement being by crop or product attacked. A list of the parasite and predator enemies of these pests (pp. 388–391), an account of apiculture (pp. 392–405) and of sericulture (pp. 405–407), a three-page list of references to the literature (pp. 408–410), etc., are included, as is a Description of Some of the Homopterous Citrus Pests, by H. Haupt (pp. 419–422), in which two new species are characterized.

Insects injurious to cotton in the French colonies, P. Vayssière (*Faune des Colonies Françaises, Tome IV, fasc. 3, Les Insectes Nuisibles au Cotonnier dans les Colonies Françaises. Paris: Soc. Éd. Géogr., Marit. et Colon., 1930, pp. [2]+193–438, pls. 18, figs. 57*).—This work dealing with the cotton insects of importance in the French colonies gives descriptions of the several stages of many of the insects treated and considers their distribution, biology, nature of

injury, natural enemies, and means of control. The arrangement is by orders as follows: Orthoptera (pp. 195–205), Isoptera (pp. 206–209), Coleoptera (pp. 210–245), Lepidoptera (pp. 246–323), Hemiptera (pp. 324–411), and Myriapoda and Acarina (pp. 412–414). References are made to the literature, a 17-page list of which is included.

Ratoon cotton in relation to insect pests, I. Bishara (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 96 (1930), pp. [3]+68, pls. 24*).—An account of experiences in other countries is followed by a report of recent experiments on ratoon cotton in Egypt.

The sugar cane root caterpillar and other new root pests in Puerto Rico, F. Seín, jr. (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 3, pp. 167–191, pls. 10*).—A root boring caterpillar found in Porto Rico in the soil around sugarcane roots to which the name sugarcane root caterpillar has been given is described as representing a new pyralid genus and species, *Perforadix sacchari.* In the early instars the caterpillars feed on the very tender roots or in their absence may tunnel in the cortex of the mature roots of sugarcane. The later instar caterpillars tunnel in the thick, succulent tips of the tender roots. The damage is cumulative, the number of caterpillars and the amount of injury increasing as the plantation grows older. "The injury may not show above ground but probably it causes always some reduction in yield and shortens the duration of the plantation. Upon the advent of dry weather and when the soil conditions are unfavorable for the production of new roots, the destruction of the root tips may become in some localities the limiting factor in sugarcane growing."

Other new root pests of sugarcane whose injuries have been found associated with those of the root caterpillar are the symphylid *Hanseniella* sp., the bristletails *Nicoletia* and *Lepisma* spp., and the sow bug *Philoscia culebrae* Moore.

The sugar cane insect problem in Negros, W. D. Pierce (*Ent. Soc. Wash. Proc., 32 (1930), No. 6, pp. 99–104*).—This general account includes a list of the principal sugarcane insects found on the island of Negros, one of the Visayan group of the Philippine Islands, arranged according to the nature of their injury to the plant.

Garden foes, T. W. Sanders (*London: W. H. & L. Collingridge, [1929], pts. 1, pp. 140, pls. 22, figs. 41; 2, pp. 106, pls. 29, figs. 31; 3, pp. 109, pls. 29, figs. 48*).—Part 1 of this work on garden pests met with in Great Britain deals with flower foes, part 2 (E. S. R., 46, p. 656) with fruit foes, and part 3 with vegetable foes. Included in the work are 40 colored plates which illustrate the life history of and injury caused by the more important pests described.

Insects attacking fruit trees, L. Caesar (*Ontario Dept. Agr. Bul. 356 (1930), pp. 70, figs. 71*).—A revision of Bulletin 250 (E. S. R., 38, p. 460).

The occurrence of Sahlbergella spp. and other pests of cacao in Fernando Póo, San Thomé, and the Belgian Congo, G. S. Cotterell (*Gold Coast Dept. Agr. Bul. 20 (1930), pp. 162–171*).—A tour made by the author in the cacao areas of Fernando Po, Saint Thomas (San Thomé), and the Belgian Congo in the latter half of 1928 led to the definite conclusion that *Sahlbergella* spp. are indigenous to the mainland, no cases of damage having been observed during the extensive tour. It is pointed out that *S. theobroma* has only once been recorded as occurring outside the Gold Coast, a single specimen having been taken in Sierra Leone.

Handbook of citrus insect control for 1930, R. S. Woglum et al. (*Calif. Fruit Growers Exch., Los Angeles, Bul. 7 (1930), pp. [1]+45, fig. 1*).—This handbook is a continuation of those previously noted (E. S. R., 62, p. 451).

Protecting shade trees and shrubs against insects, J. J. Davis (*Purdue Agr. Ext. Bul. 168 (1930), pp. 36, figs. 20*).—This is a practical account.

Insects useful as enemies of other insects in Cuba [trans. title], **S. C. Bruner** (*Rev. Agr., Com. y Trab. [Cuba], 12 (1930), No. 16, pp. 11–18, figs. 3*).—An account of the beneficial insect predators and parasites in Cuba.

Treatise on parasitology.—Vol. IV, Arthropod parasites and transmitters of disease, I, II, C. Pinto (*Tratado de Parasitologia.—Vol. IV, Arthrópodes Parasitos e Transmissores de Docnças, I, II. Rio de Janeiro: Pimenta de Mello & Co., 1930, pts. 1–2, pp. XVI+845, pls. 36, figs. 356*).—The 19 chapters of this work, dealing with as many groups of arthropods, are accompanied by bibliographies of the literature, and a general bibliography is appended. Tables are given which show the distribution of ticks, fleas, simulids, and mosquitoes in South and Central American countries, listing the parasites of which fleas are the intermediate hosts, etc.

Helminth parasites of stock in British West Indies, T. W. M. Cameron (*Jour. Helminthol., 8 (1930), No. 2, pp. 77–84*).—This account includes lists of the helminths occurring in cattle, sheep and goats, pigs, and equines.

The helminth parasites of the goat in Britain, including an account of Skrjabinema ovis (Skrjabin, 1915) Werestchagin, 1926, D. O. Morgan (*Jour. Helminthol., 8 (1930), No. 2, pp. 69–76, figs. 6*).—It appears that the species recorded in this paper from British goats are, with two exceptions, namely, *S. ovis* and *Trichostrongylus capricola*, also common parasites of sheep in Great Britain. The number of goats examined is said to be too small for the determination of the relative frequency of the different species in the country. In the animals examined *Haemonchus contortus*, *Ostertagia circumcincta*, and *Oesophagostomum venulosum* were the most common, being found in 14 individuals, while *Chabertia ovina* and *Trichuris ovis* were found in 9 and *Muellerius capillaris* in 8 of the goats.

On the coccidia of wild animals [trans. title], **E. F. Rastegaïeff** (*Arch. Protistenk., 71 (1930), No. 3, pp. 377–404, figs. 8*).—This is an account of the occurrence of coccidia in wild animals, presented in connection with a list of 59 references to the literature.

Solubilities of fluosilicates in water, R. H. Carter (*Indus. and Engin. Chem., 22 (1930), No. 8, pp. 886, 887, fig. 1*).—Data upon the solubilities of fluosilicates have been brought together, and, with formulas and references from the literature, are presented in tabular form.

Selection of petroleum oil for spraying purposes, E. R. de Ong (*Indus. and Engin. Chem., 22 (1930), No. 8, pp. 836–839*).—A general discussion presented at the annual meeting of the American Chemical Society held in Atlanta, Ga., in April, 1930.

Fumigation gas concentrations under tents, F. S. Pratt (*Calif. Citrogr., 15 (1930), No. 10, pp. 440, 455–457, figs. 7*).—The author's investigations of tent leakage and the testing of fabrics reported upon include data in tabular and chart form.

"Leakage meter tests on canvas fabrics do not provide a reliable index of the tightness of tents when operated under field conditions. There is a marked difference between the leakage of gas from a tent and the diffusion of gas through a sample of fabric. With tents, moisture in the air plays a more important part in the factor of tent leakage than the fabric from which the tents are made. This is due to the fact that wetting the tent causes the fibers of the fabric to swell which in turn tends to close the interstices of the weave, thus making the tent tighter. The results of actual tests show that a 6.5-oz. drill tent may be just as tight as an 8-oz. U. S. Army duck tent. This is at-

tributed to the fact that drill fabrics tend to tighten more than 7- or 8-oz. ducks. Old tents in good repair may be just as tight, if not tighter, than new tents of 8-oz. U. S. Army duck. Until shrinkage of the cloth has taken place in a new tent the gas concentrations will be lowered more rapidly by leakage than is the case with a tent that has seen one or more season's use.

"The effect of wind movements during fumigation is to lower the gas concentration under the tent by increasing the leakage, and this, in turn, lowers the efficiency of the process."

[Contributions on termites] (*Amer. Wood-Preservers' Assoc. Proc., 26 (1930), pp. 298–334, figs. 3*).—Contributions on termites presented at the annual meeting of the American Wood-Preservers' Association, held at Seattle, Wash., in January, 1930, are as follows: Why Is There a Termite Problem in California? by C. A. Kofoid (pp. 298–307); Termites and the Retail Distribution of Treated Timber Products, by M. Randall (pp. 307–315); and An International Termite Exposure Test, by G. M. Hunt and T. E. Snyder (pp. 318–334).

Termites attacking Hevea brasiliensis in Ceylon, F. P. Jepson (*Trop. Agr. [Ceylon], 75 (1930), No. 3, pp. 143–156, figs. 5*).—A general account of termites, termites of the genera Calotermes and Coptotermes, and the local distribution of termites known to attack India rubber.

Do cockroaches eat bed bugs? A. N. Gulati (*Nature [London], 125 (1930), No. 3162, p. 858*).—The writer refers to experiments conducted in which it was found that the American cockroach ate bedbugs, preferring young individuals which had soft blood-engorged abdomens. The maximum number of cimicids eaten by a single cockroach was 3 of 12 that were supplied to it in a period of 48 hours.

The tea seed bug (Poecilocoris latus Dall), E. A. Andrews (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1930, No. 1, pp. 15–27*).—Cyanogas calcium cyanide was found to kill an appreciable percentage of *P. latus* in the area treated.

The food habits of Erthesina fullo (Thunb.), W. E. Hoffmann (*Lingnan Sci. Jour., 9 (1930), No. 1–2, pp. 139–142, fig. 1*).—A list is given of 30 food plants of the large pentatomid *E. fullo*, which is very common in Kwangtung Province and in Hainan Island, where the adult feeds on the trunks of trees from a few inches from the ground up to a height of seven or more feet and occasionally on large branches.

The mango hopper problem in south India, Y. Ramachandra Rao (*Agr. Jour. India, 25 (1930), No. 1, pp. 17–25*).—In this discussion the author deals with the mango hoppers, particularly *Idiocerus niveosparsus*, their effect on the crop, and remedial measures found effective.

Some observations on the life history of the tomato psyllid (Paratrioza cockerelli Sulc.) (Homoptera), R. S. Lehman (*Jour. N. Y. Ent. Soc., 38 (1930), No. 3, pp. 307–312*).—In observations conducted at Fort Collins, Colo., of this enemy of the tomato, its life cycle was completed in 25 days at a temperature of from 16 to 27° C. (60.8 to 80.6° F.). An average of 75 eggs were deposited.

Transmission of potato leaf-roll, T. Whitehead (*Nature [London], 125 (1930), No. 3165, pp. 974, 975*).—In the course of experimentation on potato leaf roll proof was obtained that *Myzus circumflexus* (Buck.) is an efficient transmitter of the virus. Some evidence was also obtained that *Macrosiphum gei* (Koch) can transmit leaf roll feebly. The author has, however, failed to find any record of the occurrence of *M. circumflexus* on field potatoes in Great Britain, and it is unlikely to be of much importance as a field transmitter of virus diseases. Records of its occurrence on Hordeum, Avena, and *Trifolium pratense* under field conditions must be considered by growers attempting to

maintain healthy potato stocks. Under greenhouse conditions it feeds voraciously on potato—whether sprouts, stem, or leaves—and in Great Britain it has proved more prolific than either the green peach aphid or *M. gei*.

Transmission of potato leaf roll, K. M. SMITH (*Nature [London], 126 (1930), No. 3168, p. 96*).—In referring to the account by Whitehead above noted, the author reports having found *Myzus circumflexus* to be a poor transmitter of the virus of potato mosaic and that the saliva contains a toxin apparently absent in the green peach aphid (*M. persicae*). This aphid produces a false mosaic through its feeding alone that is likely to confuse the inexperienced worker.

Transmission of potato leaf roll, T. WHITEHEAD (*Nature [London], 126 (1930), No. 3172, pp. 241, 242*).—This contribution supplements the discussion of the aphid transmission of potato leaf roll above noted.

Contribution to our knowledge of South Indian Coccidae (scales and mealy-bugs), T. V. RAMAKRISHNA AYYAR (*Imp. Inst. Agr. Research, Pusa, Bul. 197 (1929), pp. [3]+V+73, pls. 31, figs. 9*).—This revised edition of the bulletin previously noted (E. S. R., 42, p. 546) includes the additional data collected during the past decade.

The present status of the biological control of mealybugs, H. S. SMITH (*Calif. Citrogr., 15 (1930), No. 8, pp. 356, 359*).—In discussing the new parasites introduced into California from Australia, previously noted (E. S. R., 62, pp. 57, 757), their behavior is said to justify the view that they will soon control the citrophilus mealybug.

Methods for the biological control of the common coffee mealy-bug, H. C. JAMES (*Nairobi: Kenya Colony Dept. Agr., 1930, pp. IV+16, pls. 5*).—The destruction of ants, or their exclusion from coffee trees, and work with predators, particularly lady beetles, in the control of the coffee mealybug [*Pseudococcus lilacinus*], are reported upon.

Present position in regard to the control of prickly-pear (Opuntia dillenii Haw.) in Ceylon by the introduced cochineal insect Dactylopius tomentosus Lamk, F. P. JEPSON (*Trop. Agr. [Ceylon], 75 (1930), No. 2, pp. 63–72*).—It is concluded that the introduction of *D. tomentosus* into Ceylon in 1924 for the control of the pricklypear (*O. dillenii*), which had taken possession of a large tract of country in the north of the island, has been amply justified by the results thus far obtained.

Another pest confronts the avocado and citrus growers, R. S WOGLUM (*Calif. Citrogr., 15 (1930), No. 7, p. 311, fig. 1*).—The dictyospermum, or Spanish red scale, which is of major importance in Florida, made its appearance on several large avocado trees in Los Angeles, Calif., early in the present year. It has since been found infesting avocado trees in Whittier, Anaheim, and Santa Ana. The limits of its present outdoor infestation have been extended to some 30 or 40 miles. At least two citrus trees located directly beneath a large infested avocado were found infested.

On the occasional extension of territory by the brown-tail moth Nygmia phaeorrhoea and its ultimate collapse, R. ADKIN (*So. London Ent. and Nat. Hist. Soc. Proc., 1929–30), pp. 7–11*).—A brief account of the appearance of the brown-tail moth in Great Britain.

Killing codling moth eggs on harvested fruit, E. J. NEWCOMER (*Better Fruit, 24 (1930), No. 12, p. 10*).—It is pointed out that codling moth eggs on harvested summer apples and Bartlett pears, particularly on cannery pears, have, if the fruit was not put in cold storage immediately, been a source of considerable loss, many having become wormy while ripening. In the search for a means of preventing this loss it was found that temperatures of from

26 to 33° F. for 5 days killed only half the eggs, indicating that fruit would have to be held at the minimum safe temperature of 30° for at least 10 days or 2 weeks in order to kill all of the eggs. In studying the effect of the washing treatment for removal of spray residue it was found that neither the acid nor the alkaline washes in common use had any appreciable effect upon the eggs.

Several oil emulsions were tested, the viscosity of which ranged from 50 to 130, by running pears through a standard fruit washing machine holding 200 gal. of the dilute emulsion, different strengths being used both with and without casein spreader. The heavier oils tended to retard ripening and no advantage was apparent in the use of spreader. The lighter oils did not retard ripening, and the quality of the fruit was not affected. It is concluded from these tests that apples or pears may be successfully treated to kill codling moth eggs by means of this oil-emulsion bath in a fruit-washing machine. The emulsion used may contain either a summer type of oil having a viscosity of from 50 to 60 and an unsulfonated residue of from 90 to 100 per cent, or it may be an oil such as is used in dormant emulsions, having a viscosity of about 100 and an unsulfonated residue of 60 to 70 per cent. The emulsion should be used at a strength of 1 gal. to 100 gal. of water, and the fruit should not be rinsed.

Codling moth control: Spraying tests, A. A. Hammond (*Jour. Dept. Agr. Victoria, 28 (1930), No. 7, pp. 400–420, figs. 2*).—A report of spraying work with the codling moth in orchards at Templestowe and Doncaster, the details of which are presented in tabular form. The season's work suggests that arsenical calyx sprays followed by oil alone do not give an effective control in the southern district. The indications are that an arsenical calyx spray followed by the oil-arsenate combination to control the first brood of moths, which during the last season extended from late October to mid-December, will give efficient control.

Codling moth control: Report on 1929–30 experiments at Harcourt, R. T. M. Pescott (*Jour. Dept. Agr. Victoria, 28 (1930), No. 8, pp. 486–490, fig. 1*).—The findings of the year are said to confirm the conclusions of earlier experiments (E. S. R., 62, p. 854), namely, that arsenate of lead alone fails to give a satisfactory control of the codling moth. The arsenate of lead sprays followed by white oil emulsion sprays at a strength of 1 in 40 again gave a very marked increase in control over other sprays, and their use was found to be economically profitable.

Studies of the life history of Carpocapsa pomonella L. (Lep. Tortr.) in Palestine [trans. title], F. S. Bodenheimer and A. Naim (*Anz. Schädlingsk., 6 (1930), No. 7, pp. 73–79, figs. 4*).—In this report of studies of the biology of the codling moth in Palestine, most of the data are presented in tabular and chart form.

The European corn borer since 1920 (Pyrausta nubilalis Hbn.): A bibliography, A. L. Flett (*Madison: Univ. Wis., Library School, 1928, pp. [2]+18+[1]*).—This is a bibliography in typewritten form which supplements that of Wade issued in 1925 (E. S. R., 54, p. 55).

A new insecticide against maize stalk-borer, L. B. Ripley and G. A. Hepburn (*Farming in So. Africa, 5 (1930), No. 54, pp. 285–287*).—It is reported that the practice of top-dressing as a control measure for the cornstalk borer has increased to a remarkable extent in the past five years in South Africa, farmers in all parts of the Union having shown great interest in this method of combating the pest, the value of which has been enhanced by the discovery of the new Derrisol.

New bacteria pathogenic to the larvae of Pyrausta nubilalis [trans. title], V. CHORINE (*Ann. Inst. Pasteur, 43 (1929), No. 12, pp. 1657–1678, figs. 6*).—This account has been noted from an English source (E. S. R., 63, p. 849).

On the natural immunity of Pyrausta nubilalis [trans. title], S. MÉTALNIKOV and V. CHORINE (*Ann. Inst. Pasteur, 44 (1930), No. 3, pp. 273–297, fig. 1*).—This account has been noted from an English source (E. S. R., 63, p. 849).

A preliminary account of three rice stem borers, H. T. PAGDEN (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 1 (1930), pp. [5]+30, pl. 1, figs. 7*).—Of the three rice stem borers *Diatraea auricilia* Dudg., *Schoenobius incertellus* Walk., and *Sesamia inferens* Walk., the life histories of which are here considered, the first mentioned was the most important in the serious outbreak of stem borers in Krian district, Perak, in the 1928–29 paddy season. Mention is made of five parasites recorded as attacking *D. auricilia* and three as attacking *S. incertellus*. A somewhat extended laboratory study made of the egg parasite *Trichogramma nanum* Zehnt, first recorded in the department in 1922, is reported upon (pp. 19–29).

A new leaf-miner of cotton in Porto Rico (Nepticula gossypii new species), W. T. M. FORBES and M. D. LEONARD (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 3, pp. 151–157, pls. 2*).—A lepidopterous leaf miner found severely infesting the leaves of sea island cotton in a small field near Juana Diaz, P. R., is described as new under the name *N. gossypii*. Notes on its life history, habits, parasites, and economic importance are included.

The brown cutworm (Euxoa radians Guen.), I–III, G. A. CURRIE (*Queensland Agr. Jour., 34 (1930), Nos. 1, pp. 10–16; 2, pp. 138–163, pls. 10; 4, pp. 383–390, pl. 1*).—Part 1 deals with the life history and habits of *E. radians*, which is distributed over all the coastal areas and westward over the coastal range into the closely settled districts of the Burnett, Callide, and Dawson Rivers. The second part deals with temperature reactions and laboratory technic; presents the results of temperature work, the details of which are charted; and gives technical descriptions of the life stages. The third part deals with natural enemies.

The relative value of larval destructors and the part they play in mosquito control in Queensland, R. HAMLYN-HARRIS (*Roy. Soc. Queensland Proc., 41 (1929), pp. 23–38, pls. 8*).—In this account particular attention is given to the larvivorous fish, quite a large number of which occur in southern Queensland and are capable of doing effective work in fresh, brackish, and salt water. Among the species most highly recommended are *Craterocephalus fluviatilis* and *Melanotaenia nigrans* for fresh water and *Pseudomugil signifer* for brackish and salt water. A distinction is drawn between larvivorous as surface feeders and larva-feeding fish as bottom feeders. The Characeae as possible larvicides, predatory insects, etc., are noted.

Epidemics of the Hessian fly (Mayetiola destructor Say) in Latvia [trans. title], E. OZOLS (*Lauksaimniecības Mēnešraksts, 1930, No. 6, pp. 374–389, figs. 8; Eng. abs., pp. 2, 3*).—A discussion of the outbreaks of the Hessian fly in 1883, 1924, and 1929.

The control of the red bud borer, L. N. STANILAND and E. UMPLEBY (*Jour. Min. Agr. [Gt. Brit.], 37 (1930), No. 1, pp. 59–63*).—Experiments show that attacks of the cecidomyid fly *Thomasiniana oculiperda* Rübs., the larva of which is known as the redbud borer, may be prevented on the rose and the apple by thoroughly coating the buds with ordinary vaseline immediately after tying.

The bionomics of some Tabanidae (Diptera), A. STONE (*Ann. Ent. Soc. Amer., 23 (1930), No. 2, pp. 261–304, figs. 12*).—A report of studies of the biology of the horse flies conducted at Ithaca, N. Y. The account includes generic

keys to the immature stages and keys to the mature larvae of Chrysops and Tabanus. A two-page list of references to the literature is included.

On the biology of the horse botflies [trans. title], G. Dinulescu (*Compt. Rend. Acad. Sci.* [*Paris*], *191* (*1930*), *No. 12, pp. 499–501*).—Observations of the larval development of the horse botfly, the nose botfly, and *Gastrophilus inermis* Br. are reported upon.

The warble flies of cattle, R. S. MacDougall (*Highland and Agr. Soc. Scot. Trans., 5. ser., 42* (*1930*), *pp. 75–112, figs. 23*).—This is a practical summary of information on warble flies which incorporates the results of recent investigations (E. S. R., 57, p. 560).

Insect pests of the hive.—I, The tachinid parasite, S. H. Skaife (*So. African Bee Jour., 1926, Aug.; also in Bee World, 11* (*1930*), *No. 9, pp. 106, 107*).—This is a brief account of the tachinid parasite *Rondaniooestrus apivorus*. After its deposition upon the bee's body the maggot enters through one of the thin intersegmental membranes of the abdomen and develops within the body for a period of about one month, causing the death of the bee.

Flies injurious to domestic animals in Mauritius, A. Moutia (*Mauritius Dept. Agr., Sci. Ser. Bul. 15* (*1930*), *Eng. ed., pp. 8, pls. 2*).—A brief account of two flies, namely, *Chrysomyia albiceps* and *Sarcophaga haemorrhoidalis*, which cause myiasis in Mauritius, and of *Stomoxys nigra*, which causes keratitis of bovines.

The cabbage root maggot (Hylemyia brassicae Bouche) attacking carnations, G. J. Spencer (*Ent. Soc. British Columbia Proc., No. 25* (*1928*), *pp. 21–23, fig. 1*).—An account of injury caused to the root system of carnations from New Westminster, B. C., by the cabbage maggot.

The carnation fly (Hylemyia brunnescens Zetterstedt) [trans. title], J. Bruneteau (*Rev. Zool. Agr. et Appl., 29* (*1930*), *No. 3, pp. 37–46, pl. 1, figs. 11*).—An account of *H. brunnescens* and the injury caused by it to Dianthus in France.

On the presence of the non-pathogenic Trypanosoma melophagium in the blood of Victorian sheep, and its transmission by Melophagus ovinus, A. W. Turner and D. Murnane (*Aust. Jour. Expt. Biol. and Med. Sci., 7* (*1930*), *No. 1–2, pp. 5–8, pl. 1*).—*T. melophagium* has been found by the authors in sheep in Victoria and its transmission by the sheep tick by ingestion confirmed.

The Asiatic beetles in New Jersey, E. G. Rex (*N. J. Dept. Agr. Circ. 178* (*1930*), *pp.* [*15*], *figs. 10*).—This is a practical account of the Japanese beetle, the Asiatic beetle, and the Asiatic garden beetle (*Autoserica castanea* Arr.). It includes colored plates of the adults.

Depredations to lead-covered aerial cables by beetles in Brazil, E. J. P. Rendell (*Ent. Soc. Wash. Proc., 32* (*1930*), *No. 6, pp. 104–113, pl. 1, fig. 1*).—This account deals particularly with investigations made of the Pernambuco beetle, *Megaderus stigma* L., of the family Cerambycidae. Lead boring cable trouble is reported to occur in the States of Bahia and Espirito Santo also. The account includes a report by R. C. Shannon of observations of this beetle, also of its probable life history in its normal habitat.

The catalase content of the Colorado potato beetle during metamorphosis, D. E. Fink (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 9, pp. 691–696, fig. 1*).—This is a report of observations made of the changes in the catalase content of the Colorado potato beetle during its histolysis and pupal differentiation. The variation in the activity of the catalase during the metamorphosis of this beetle, beginning with the mature larva, was ascertained by making daily determinations of the quantity of oxygen per gram of tissue evolved from hydrogen peroxide by the action of catalase during prepupal and pupal development.

"Analysis of the resulting data indicated a reduction in catalase of 16 per cent on the first day of histolysis and 19 per cent on the second, followed on the third day of histolysis by an increase which, when the pupa was formed, reached the maximum of 6 per cent above that of the mature larva. The decline in content of catalase during pupal development was continuous thereafter until a reduction of 51 per cent below that of the mature larva was reached with the formation of the adult."

The curves here obtained for catalase content and those previously reported by the author [1] for oxygen consumption and excretion of carbon dioxide were similar for the prepupal period of histolysis. During pupal development, however, the catalase curve declined rapidly, whereas the curves for oxygen and carbon dioxide followed the usual growth curve.

Experiments on the life history and control of the yam beetle in the Benue Province of Nigeria, O. B. Lean (*Nigeria Agr. Dept. Ann. Bul., 8 (1929), pp. 43–57*).—An account of the dynastid beetle *Heteroligus claudius* Klüg., a serious pest of yams in Nigeria, particularly of its life cycle and means of control.

Two new species of eumolpid-beetles noxious to the mulberry-tree in the Liu-kiu Islands, H. Yuasa (*Imp. Acad. [Japan], Proc., 6 (1930), No. 7, pp. 293–295, figs. 2*).—In this contribution from the Imperial Agricultural Experiment Station at Tokyo the author describes two chrysomelids which are injurious to mulberries in the adult stage under the names *Rhyparida sakisimensis* n. sp. and *Abirus yashiroi* n. sp.

The effect of the elaterid beetles upon sugarcane planting in Formosa [trans. title], Y. Miwa and M. Yanagihara (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 1 (1929), No. 3, pp. 275–289, pl. 1; Eng. abs., pp. 287–289*).—A list is given of 19 species of elaterid beetles met with in sugarcane fields in Taiwan (Formosa). The most injurious of these is *Melanotus tamsuyensis* Bates, which causes almost 98 per cent of all the wireworm damage to cane. Next following in importance are *Agonischius obscuripes* Gyllenhal, *A. vittiger* Heyden, and *Sephilus formosanus* Schwarz.

A new technique in tree medication for the control of bark beetles, F. C. Craighead and R. A. St. George (*Science, 72 (1930), No. 1869, pp. 433–435*).—Preliminary work with the southern pine beetle in shortleaf pine in North Carolina conducted over the years 1925, 1926, 1927, and 1928 led to the treatment during the summer of 1929 of approximately 200 trees. This was carried out with the view to killing the developing broods under the bark and thus preventing their escape and attack of other living trees.

The technic, which includes the ringing practice of orchardists, by which from 2 qt. to several gallons of liquid can be injected into a tree in a few hours and thorough distribution obtained through all the outer annual rings severed and to the topmost branches and leaves, is described. It is said that 2 qt. was ample in most cases on the relatively small trees used to destroy the southern pine beetle in shortleaf pine. In general, the results obtained were most encouraging, complete brood mortality resulting in practically all cases with certain chemicals, provided the application was made before the sapwood became blue stained by associated fungi and the ascending sap stream disturbed.

A few of the materials used, the quantities, and the results obtained are summarized in tabular form.

On the genus Xyleborus (*Indian Forest Rec., 14 (1930), No. 9–10, pp. 177–272, pls. 2, figs. 8*).—Two papers are presented, as follows: New Species of

[1] Jour. Gen. Physiol., 7 (1925), pp. 527–548, figs. 18.

Xyleborus (Col. Scolytidae) in India [trans. title], by H. Eggers (pp. 177–208), and The Biology of the Genus Xyleborus, with More New Species, by C. F. C. Beeson (pp. 209–272).

A little-known root-weevil of cassava (Coelosternus sulcatulus Boheman), M. D. Leonard (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 3, pp. 159–165, pls. 3, fig. 1*).—An account of the root weevil *C. sulcatulus*, originally described from Guadeloupe, which has been found damaging the roots of cassava on a farm in Porto Rico. It is estimated that 10 per cent of the roots were worthless.

The biology of the white pine weevil, Pissodes strobi (Peck), and a study of its insect parasites from an economic viewpoint, R. L. Taylor (*Ent. Amer., n. ser., 9 (1929), No. 4, pp. 166–246; 10 (1929), No. 1, pp. 86, pls. 10*).—This is a report of studies of the biology and injury of the white pine weevil (pp. 169–205) and of its parasites (pp. 206–246, 1–73), conducted in Maine, and presented in connection with a bibliography of 11 pages. The parasites, the biologies and effectiveness of which are reported upon, in order of their importance are *Eurytoma pissodis* Gir., *Lonchaea corticis* Tay., *Microbracon pini* Maes, *Eupelmus pini* Tay., *Rhopalicus pulchripennis* (Cwfd.), *Coeloides pissodis* (Ashm.), *Calliephialtes nubilipennis* (Vier.), *Spathius* sp., *Pleurotropis* n. sp., *Eucoila* sp., and *Hemiteles humeralis* Prov. The hymenopterous parasites of this weevil previously reported, including exotic species, are listed and its insect predators and associated nematodes noted. Reports of studies of this pest by Plummer and Pillsbury in New Hampshire (E. S. R., 63, p. 56) and MacAloney in New York (E. S. R., 63, p. 358) have been noted.

Overwintering of the fire blight pathogen, Bacillus amylovorus, within the beehive, H. R. Rosen (*Science, 72 (1930), No. 1864, pp. 301, 302*).—In this contribution from the Arkansas Experiment Station the author reports having successfully isolated the fire blight pathogen from beehive material gathered throughout the summer, winter, and early spring and from the bees themselves obtained from the hives in the early spring prior to the development of blight. It is considered likely that this explains the common occurrence of blossom blight in the absence of twig blight and in the absence of early spring oozing from blighted twigs and limbs.

The rearing of queen-bees, A. E. Lundie (*Union So. Africa Dept. Agr. Bul. 76 (1929), pp. 23, figs. 14*).—A practical account.

Fiftieth annual report of the Beekeepers' Association of the Province of Ontario, 1929 (*Ontario Dept. Agr., Beekeepers' Assoc. Ann. Rpt., 50 (1929), pp. 120*).—This is a report of the proceedings of the annual meeting of the association (E. S. R., 62, p. 159).

Infectious diseases of the honeybee, A. Borchert (*Die Seuchenhaften Krankheiten der Honigbiene. Berlin: Richard Schoetz, 1930, 3. ed., rev., pp. [4]+96, figs. 53*).—The third edition of a practical work previously noted (E. S. R., 57, p. 457).

Bairamlia fuscipes Waterston a chalcidoid parasite on Ceratophyllus wickhami Baker (Siphonaptera), E. K. Sikes (*Parasitology, 22 (1930), No. 3, pp. 361–369, figs. 4*).—The chalcidoid wasp *B. fuscipes* was found by the author to be parasitizing the flea *C. wickhami* in the nest of the North American ground squirrel from Gerrards Cross, Buckinghamshire, England. The larval and pupal stages of *B. fuscipes* were found in the cocoons of *C. wickhami*, and the adults were crawling about in the squirrel's nest. The parasites were scarce, only 7 per cent of the cocoons dissected at intervals during 15 months being parasitized. The parasite oviposits through the flea cocoon and fixes the egg on the abdomen of a resting larva or pupa, a single egg being found in each parasitized cocoon.

The Montana tick parasite expedition to Africa, R. A. COOLEY (*Science, 71 (1930), No. 1842, pp. 419, 420*).—A brief report of the findings of the expedition to Africa in 1928 by the Montana State Board of Entomology.

Studies on the rush saw-fly.—IV, Effect of temperature upon the cocoon period of the rush saw-fly, Tomostethus juncivorus Rohwer, C. HARUKAWA and S. KONDO (*Ber. Ōhara Inst. Landw. Forsch., 4 (1930), No. 3, pp. 295–313, figs. 3*).—In this continuation of the account previously noted (E. S. R., 62, p. 159), much of the data is presented in table and chart form.

Macrorileya oecanthi Ashm., a hymenopterous egg parasite of tree crickets, L. M. SMITH (*Calif. Univ. Pubs. Ent., 5 (1930), No. 8, pp. 165–172, figs. 5*).—The author here presents data on the life history, habits, and economic significance of *M. oecanthi*, an eurytomid parasite of the eggs of tree crickets (*Oecanthus* spp.), based upon observations made largely at San Jose, Calif. In addition to the snowy tree cricket this parasite has been reared from the eggs of *O. californicus* Sauss., and it is thought probable that it will attack eggs of any tree cricket that may be accessible to it.

On the rôle of Argas persicus Oken in the transmission of Pasteurella avicida, B. C. BASU (*Indian Med. Gaz., 65 (1930), No. 6, pp. 326, 327; abs. in Jour. Trop. Med. and Hyg. [London], 33 (1930), No. 17, p. 264*).—The author records observations made in 1928 of the rôle of the fowl tick *A. persicus* in the transmission of fowl plague. The form contracted by the fowl through its ingestion of infected fowl ticks is milder and less rigidly fatal than that acquired through their external attachment to the host, indicating that there is some loss of virulence of *P. avicida* in the gut of the tick. In an experiment carried out with the view to determining if it is possible for Pasteurella infection to be acquired by the fowl through ingestion of infected bedbugs and to discover whether these ectoparasites could convey infection by their bite, neither of the birds tested contracted the disease.

Monographs on the medical entomology of Mexico.—I, The argasids of Mexico [trans. title], C. C. HOFFMANN (*An. Inst. Biol. [Univ. Nac. Mex.], 1 (1930), No. 2, pp. 135–164, figs. 28*).—This first monograph deals with the argasid ticks of the genera Argas and Ornithodoros occurring in Mexico.

Some observations on the life history of the cattle tick (Boophilus australis), J. LEGG (*Roy. Soc. Queensland Proc., 41 (1929), pp. 121–132*).—The author's studies of the biology of the cattle tick *B. australis* in Australia indicate that the slight differences in its life history from that in America are due to the diversity of climate.

A note on the life history of the large American fluke, Fasciola magna (Bassi), D. F. SINITSIN (*Science, 72 (1930), No. 1863, pp. 273, 274*).—A summary is given of the results of an investigation of the life history of *F. magna*, based upon a survey of the Western and Southern States from the spring of 1929 to the spring of 1930, with an extended study in the region of the swampy plains of southern Texas and at Houston.

Unlike *F. hepatica* the large liver fluke of cattle apparently has nothing to do with the bile system, but lives in the liver tissues, or sometimes as an erratic parasite in the lungs, inclosed in the liver in an encapsulated cyst which does not seem to have any connection with the bile ducts. The eggs were never observed in the bile of an infested cow, but were found rather abundantly in cases of heavy infestations in the cysts and in the contents of the digestive tract. This suggests that the eggs may use the blood system in escaping from infested animals, though positive confirmation of this was not obtained.

The eggs, miracidia, and cercaria of *F. magna* are compared with those of *F. hepatica*. In experiments conducted the author found the miracidia of *F.*

magna to attack readily *Galba bulimoides techella* Hald., a very common snail in the area investigated, in which they developed successfully and produced their first generation of rediae. This snail is also the intermediate host for the common liver fluke, which is widely distributed through the Southern States and is the only limnaeid species that is widely distributed there. It is pointed out that in the Western States, where, save for the southern part of California, *G. bulimoides techella* is absent, *G. bulimoides* Lea appears to be responsible for the spread of liver fluke disease, as was experimentally proved by Shaw and Simms for Oregon (E. S. R., 61, p. 856) and later by Freeborn, Jay, and the author for California (E. S. R., 62, p. 752).

ANIMAL PRODUCTION

[Experiments with beef cattle at the Montana Station] (*Montana Sta. Rpt. 1929, pp. 60–63, 71–74, 75, 76, figs. 6*).—The results of several experiments are noted.

Fattening yearling steers on grain and hay, H. W. Vaughan, W. E. Joseph, and L. Vinke.—Three lots of 10 steers each were fed for 157 days on a ration of equal parts of ground frosted wheat and ground hull barley and alfalfa hay. Lot 1 was on a full feed, lot 2 on 75 per cent of a full feed, and lot 3 on 50 per cent of a full feed. The average daily gains were 2.27, 1.97, and 1.74 lbs. per head, and the return per head over feed cost was highest in lot 1 and lowest in lot 3.

Steers receiving an average of 12 lbs. of ground frosted wheat and 13 lbs. of alfalfa hay per head daily gained 2.13 lbs. per head per day, while similar steers fed a like amount of ground hull barley and alfalfa hay gained 1.89 lbs. per head daily. Lot 1 made more economical gains, attained a higher finish, and returned a larger profit per head than lot 2. A third lot fed in the same manner, except that the grains were mixed in equal parts, produced intermediate results.

During a 158-day period 5 lots of 10 steers each, averaging approximately 762 lbs. per head, were fed alfalfa hay and in addition the respective lots received hull barley, hull-less barley, low-protein wheat, hull barley and oats, and hull barley and cull beans. The average daily gains were 2.03, 2.16, 2.07, 1.97, and 1.75 lbs. per head in the respective lots. Lot 2 returned the greatest margin per head over costs, followed in descending order by Lots 3, 1, 4, and 5. The cull beans fed in lot 5 proved too laxative when fed to the animals in this test.

Feeding beet by-products to fattening cattle, H. W. Vaughan, W. E. Joseph, and L. Vinke.—This 128-day study was conducted in cooperation with several parties at Billings, Mont., using 8 lots of 16 steers each, averaging 950 lbs. per head. It was found that the addition of 1.5 lbs. of cottonseed cake per head daily to a ration of beet pulp, alfalfa hay, and molasses practically doubled the gains, decreased the cost of feed, and changed the margin over costs from a loss to a profit. Adding 4 lbs. of barley to the cottonseed cake, pulp, hay, and molasses ration increased the rate and cost of gains, the selling price, and the profits, but using cull beans instead of barley proved a detriment to the ration. When 4 lbs. of molasses was added to a ration of wet pulp and hay the rate of gain was decreased, the cost of gain increased, and the margin over cost decreased, and adding 5.5 lbs. of molasses still further lessened the value of the ration. Substituting all the bean straw the animals would consume for half of the hay in a ration of pulp, alfalfa hay, and molasses increased the consumption of dry roughage, decreased the amount of pulp eaten and the cost of gain, and increased the rate of gain and the margin over costs.

Beef cattle experiments [at the Northern Montana Substation], G. Morgan.—Two years' study have shown that when alfalfa hay is worth $10 per ton oat hay is worth $11.14, sweetclover $10.39, bluejoint $10.08, and corn fodder $6.87 for wintering beef cows.

Three lots of calves, averaging 350 lbs. per head, were full fed for 167 days on the following rations: Lot 1, ground barley and oats 3 : 1 and alfalfa hay; lot 2, ground rye and oats 3 : 1 and alfalfa hay; and lot 3, the same as lot 1 except that the hay was cut in short lengths and mixed with the barley. The average daily gains were 2.03, 1.91, and 2.19 lbs. per head, respectively. There was little difference in the cost of gains, but lot 3 attained the highest finish.

A lot of 9 calves were fed a ration of 3 lbs. of frosted wheat daily and all the hay they would consume during a wintering period, 8 lbs. of frosted wheat on native pasture to September 1, and full fed for 79 days on frosted wheat and alfalfa hay. The average daily gains over the entire period were 1.65 lbs. per head. This lot returned a margin of $32.71 per head over cattle and feed costs as compared with a margin of $12.85 per head for a similar lot full fed the first winter and sold in the spring.

Beef cattle [at the U. S. Range Livestock Experiment Station], J. R. Quesenberry et al.—A lot of beef cows wintered on range without supplement lost 28 lbs. per head, while a second lot fed 131.5 lbs. of cottonseed cake per head during the 150-day period gained 5 lbs. per head. Yearling heifers fed an average ration of 18.8 lbs. of alfalfa hay and 3.7 lbs. of oat straw gained 62.6 lbs. per head during a 56-day wintering period, whereas a similar lot receiving 18.9 lbs. of bluejoint hay and 3.1 lbs. of oat straw gained 46.9 lbs. A third lot fed 10.7 lbs. of alfalfa hay and 8.9 lbs. of oat straw for 84 days gained 40.2 lbs. per head.

During a 150-day period 2-year-old steers on range supplemented with 131 lbs. of cottonseed cake for the entire winter period lost 28 lbs. per head. A similar lot on range only lost 50 lbs. per head. During a 71-day wintering period yearling steers fed an average of 21.4 lbs. of alfalfa hay and 1.3 lbs. of oat straw gained 88.6 lbs., those fed 10.9 lbs. of alfalfa hay and 8.4 lbs. of oat straw gained 47.5 lbs., and those fed 5.6 lbs. of alfalfa hay and 13.8 lbs. of oat straw gained 21.6 lbs. per head.

Three groups of 13 steer calves each were fed for 106 days on the following rations: Lot 1, 11.26 lbs. of alfalfa hay, 0.75 lb. of oat straw, and 0.65 lb. of cottonseed cake; lot 2, 9.73 lbs. of alfalfa hay and 2.06 lbs. of oat straw; and lot 3, 6.11 lbs. of alfalfa hay and 4.9 lbs. of oat straw. The average gains per head were 78.8, 47.9, and 27.7 lbs., respectively.

[Experiments with beef cattle], G. A. Brown (*Michigan Sta. Rpt. 1928, p. 150*).—Continuing this study with beef calves (E. S. R., 63, p. 856), it was found that based on a 10-year average acre yield of corn and barley it required 87.9 acres of crops to feed 50 calves from a weight of 400 to 800 lbs. when fed barley and only 68.4 acres when fed corn. The actual acreage of grain required was 50.6 and 38.1 of barley and corn, respectively.

Beef from calves fed grain before and after weaning, W. H. Black and E. A. Trowbridge (*U. S. Dept. Agr., Tech. Bul. 208 (1930), pp. 24, figs. 9*).—Concluding this cooperative study with Sni-a-Bar Farms and the Missouri Experiment Station (E. S. R., 63, p. 763), it was found that well-bred calves fed grain from the time they would eat it until weaning time were usually fat enough at weaning for slaughter and weighed approximately 100 lbs. more than calves receiving no grain. Under market conditions that existed between 1925 and 1930 this method of feeding well-bred, native, early spring calves was profitable.

It was found that the creeps for calves running with their dams had to be located so that the calves came to the creeps often and regularly for feed.

When the creep-fed calves are separated from their dams and allowed to nurse twice daily, the creeps and inclosures must be located so that cows and calves will not worry one another between nursings. For success in creep feeding, troughs, bunks, and sheds must be kept clean.

When calves were creep-fed for from 4 to 8 weeks before weaning they made economical use of their feed, were in better shape to sell, shrank less, and could be put on full feed sooner after weaning than calves that had no grain previous to weaning. When full-fed for 84 days after weaning the creep-fed calves made desirable slaughter animals, while those that had received little or no feed before weaning were not fat enough. When fed in dry lot for 196 days after weaning, the calves that had received grain previous to weaning made approximately 7 per cent less gain and required about 8 per cent more feed per unit of gain than calves that had had little or no grain before weaning.

At weaning time the calves that had been fed little or no feed during the suckling period graded about middle choice as feeders, while the calves that had been fed graded high choice. This superiority was maintained between the two methods of feeding when the animals were graded as slaughter cattle after 196 days' feeding and also in the carcasses, but in general there was a decline of about one-third of a grade from feeder to carcass at the end of the feeding period.

Based on the results obtained in this study, it is recommended that calves which are to be sold at weaning time or soon after weaning be fed grain in creeps during the suckling period. On the other hand, if calves are to be fed for 168 days or longer after weaning, the feeding of grain during the suckling period is not recommended.

Supplemental feeding of range cattle, J. L. Lantow (*New Mexico Sta. Bul. 185 (1930), pp. 32, figs. 2*).—Concluding this study (E. S. R., 57, p. 564), it was found that grazing was the cheapest feed in this section of the country. However, after killing frosts in the fall and before plant growth starts in the spring, it was economical to supplement the range with cottonseed cake under average relative values of cake and cattle.

It was economical to feed 0.5 lb. of cake to calves during the winter when they were to be sold in the spring, but under average conditions 1 lb. of cake was more profitable for this system of handling calves. When the calves are to be held until the following fall, not more than 0.5 lb. of cake should be fed during the winter, and after the first winter's feeding only 1 lb. of cake should be fed. While this amount has little effect upon the weight of the cow or of the calf at birth, it enables the cow to produce more milk, resulting in more rapid gains by the calf.

Except during periods of snow and storms, when cattle have to be fed to prevent starvation it is an indication that the range is either overstocked or that poor culling practices have been followed. It is usually more economical to feed animals while they are in good condition than to resort to feeding only to prevent starvation. Cows unfed during the winter had a slightly smaller percentage of calf crop, and the percentages were erratic from year to year. A minimum amount of cake showed the greatest efficiency for production and did not materially reduce summer gains, while heavy cake feeding during the winter reduced the summer gains on grass alone.

[Experiments with sheep at the Montana Station] (*Montana Sta. Rpt. 1929, pp. 66–69, 76, 77, figs. 3*).—Several experiments are noted.

Investigations in the production of lambs and wool, H. W. Vaughan, W. E. Joseph, and L. Vinke.—In this study with grade fine wool ewes it was found that the first fleece averaged approximately 2 lbs. less than the second fleece,

and the lamb crop dropped at about 2 years old weighed considerably less at weaning time than later crops. After 3 or 4 years of age there was a slow gradual decline in the weight of fleece produced, while the peak of lamb production occurred at a later age. The average weights of the lamb crops were never less than 10 lbs. in favor of ewes that had been on high mountain range during the summer. Pairs of lambs weighed from 55 to 60 per cent more than single lambs raised by the same ewes during different seasons. Fleeces grown during open, dry winter and spring seasons accompanied by much high wind averaged approximately 1 lb. heavier than those grown in normal years. Fleeces produced during a particularly wet spring, following a winter of good snow cover with little high wind, averaged approximately 0.75 lb. less than those produced during a normal season. Raising lambs reduced the weights of fleeces clipped from ewes during the season after raising the lambs.

The difference in the average weights of lamb crops between the heaviest and lightest groups of ewes was 18 lbs., and the maximum difference in weights of fleeces was 1.1 lbs. The heavy ewes raised the heavier single lambs and also raised a larger percentage of twin lambs.

Continuing this phase of the study (E. S. R., 60, p. 761), lambs sired by Hampshire rams and out of fine wool ewes averaged 5 lbs. heavier for single and 10 lbs. heavier for twin lambs and 4 and 15 lbs., respectively, for 2 seasons as compared with lambs sired by Rambouillet rams. The grade Rambouillet ewes produced heavier fleeces at the first and second shearings, but the grade Hampshires produced distinctly heavier lamb crops at 2 years old. There was little difference in the percentage of ewes raising lambs, but the grade Hampshires raised more twin lambs.

[*Sheep studies at the U. S. Range Livestock Experiment Station*], J. R. Quesenberry et al.—Ewes running on winter range and receiving a supplement of 0.5 lb. of cottonseed cake per head daily from October 15 to February 15 showed no ill effects from the cake, weighed more, were thriftier, had healthier fleeces, and gave birth to approximately 10 per cent more lambs than similar ewes receiving no supplement.

A lot of 100 grade Rambouillet wether lambs shipped to market and sold as feeders was worth $10.04 per head. A similar lot fed an average of 2.25 lbs. of alfalfa hay and 0.75 lb. of a grain mixture of 7 parts of ground barley and 1 part of cottonseed meal before being sold was worth $12.61 per head, while another lot fed the same ration without the cottonseed meal was worth $12.97 per head.

[**Experiments with swine**], G. A. Brown (*Michigan Sta. Rpt. 1928, pp. 151, 152*).—The results of two experiments are noted (E. S. R., 61, p. 459).

Cull beans for fattening pigs.—Adding tankage to a ration of cull beans and corn or cull beans and barley increased the rate and economy of gains. While cull beans are high in protein content, these studies show some deficiency in the proteins which is satisfactorily corrected by feeding animal protein.

Alfalfa and rape pasture for pigs.—Little difference has been found in the comparative value of alfalfa and rape pasture. Feeding a three-fourths ration of corn and protein supplement on alfalfa pasture was less efficient than self-feeding. The pigs on the limited ration required 21 days longer to reach market weight and consumed about the same amount of feed per unit of gain. Ground barley and ground oats without a protein supplement produced slower and more expensive gains on both rape and alfalfa pasture than did shelled corn and protein supplement. Shelled corn produced faster and more economical gains than ground barley when the pigs were self-fed on rape pasture with a protein supplement.

On the basis of a 10-year acre yield of corn and barley, it was found that when barley was fed with a protein supplement 34.9 acres were required to produce the gains needed to carry 80 pigs from a weight of 50 to 200 lbs., while 20 acres of corn would furnish enough grain to produce the same results.

The return per bushel of corn hogged down when pigs were worth $10 per hundredweight was $1.08 when Dwarf Essex rape was sown with the corn, $1.06 when Manchu soybeans were sown with the corn, and $1.02 when the corn was supplemented with tankage.

[Experiments with swine at the Montana Station] (*Montana Sta. Rpt. 1929, pp. 64–66, 74, 75*).—The results of several experiments at the station by H. W. Vaughan, W. E. Joseph, and L. Vinke are first noted.

Limited grain feeding v. self-feeding grain on alfalfa pasture.—To compare full v. limited feeding on pasture, 2 lots of 15 pigs each, averaging 50 lbs. per head, were fed through a pasture and finishing period. One lot was full fed on pasture and the other limited fed, and during the finishing period both lots were full fed. For the entire period the full-fed lot required 352.3 lbs. of barley and 30.6 lbs. of tankage and the limited-fed lot 323.6 lbs. of barley and 28.14 lbs. of tankage to produce 100 lbs. of gain. On the basis of the same final weight the full-fed pigs were finished 20 days earlier than the limited-fed pigs. In a second test a lot of 13 45-lb. pigs was limited fed on pasture followed by full feeding in the fall, and a similar lot was self-fed barley and tankage during the entire period. The first lot required 318.16 lbs. of barley and 27.16 lbs. of tankage and lot 2 391.15 lbs. of barley and 18.87 lbs. of tankage for each 100 lbs. of gain. Lot 2 attained the final weight 11 days earlier than lot 1.

One and one-half pounds concentrates per head daily best amount for production of feeder pigs on alfalfa pasture.—In this test 4 lots of 15 pigs each, averaging 50 lbs. per head, were fed on alfalfa pasture for 3 months and finished in dry lot. During the pasture season the lots received the following amounts of a concentrate mixture of barley 92 per cent and tankage 8 per cent: Lot 1 1 lb., lot 2 1.5 lbs., lot 3 2 lbs., and lot 4 2.5 lbs. per head. In dry lot the pigs were all self-fed. The combined results showed that lot 2 made the best and most economical gains, requiring 323.6 lbs. of barley and 28.1 lbs. of tankage per 100 lbs. of gain.

Hogging down field peas.—In this study it was found that when barley was worth $30 a ton and tankage $80, field peas hogged down were worth $22.98 per acre for replacing barley.

Supplements to limited barley rations on alfalfa pasture profitable.—The addition of 2 oz. of tankage to a ration of 1.5 lbs. of barley on alfalfa pasture increased the rate without increasing the cost of gains and also increased the rate and economy of gains in dry lot following pasture. The addition apparently did not affect the amount of alfalfa eaten.

Bone meal a good supplement for growing and fattening hogs.—Bone meal added to a dry lot ration of barley, tankage, alfalfa, and salt for 80-lb. pigs increased the rate and economy of gains. When fed with a limited barley ration in alfalfa pasture, the same gain was produced with bone meal as with tankage, but in dry lot pigs self-fed barley and tankage gained faster than pigs self-fed barley and bone meal. Combining the pasture and dry lot feeding, it required 375.91 lbs. of barley and 3.52 lbs. of bone meal and 318.16 lbs. of barley and 27.16 lbs. of tankage to produce 100 lbs. of gain.

Tankage for spring pigs on full feed of barley and alfalfa pasture.—Barley was self-fed from weaning time to market weight to 2 lots of 15 pigs each, averaging 50 lbs. per head. Lot 1 also received tankage, and required 352.3

lbs. of barley and 30.6 lbs. of tankage while the other lot required 418.1 lbs. of barley to produce 100 lbs. of gain. The lot receiving tankage reached market weight 20 days earlier than the other lot.

Value of cull potatoes as a feed for fattening pigs.—A lot of 13 80-lb. pigs self-fed barley with tankage and alfalfa hay made only slightly more rapid gains than a similar lot receiving the same amount of tankage and alfalfa, 2 lbs. of barley, and all the cooked cull potatoes they would clean up.

Frosted wheat, low-protein wheat, or hull-less barley better than hull barley for fattening pigs.—Three lots of 60-lb. pigs were self-fed the following rations: Lot 1 frosted wheat and tankage, lot 2 hull barley and tankage, and lot 3 hull-less barley and tankage. The most rapid gains were made in lot 3 and the slowest in lot 2. Lot 1 made the most economical gains.

A lot of pigs self-fed hull barley and tankage on alfalfa pasture required 391.15 lbs. of barley and 18.87 lbs. of tankage to produce 100 lbs. of gain, while a similar lot self-fed low-protein wheat and tankage on pasture required 351 lbs. of wheat and 11.28 lbs. of tankage for the same gain.

Experiments with growing and fattening pigs [*at the Northern Montana Substation*], G. Morgan.—In three tests with 100-lb. pigs a supplement of alfalfa hay and tankage available when hogging down corn produced practically the same gains as a supplement of tankage alone.

Pigs (10) averaging 68 lbs. per head made more rapid and economical gains when fed durum wheat and alfalfa hay than 10 similar pigs fed winter rye and alfalfa hay. Another lot fed spring rye gained faster and at a lower cost than a similar lot fed winter rye.

Adding 3 per cent of tankage to a winter rye and alfalfa ration for fattening fall pigs reduced the feed required and the cost of 100 lbs. of gain. Similar results were obtained by adding tankage to a mixture of barley and rye, equal parts, and alfalfa hay, and it also increased the rate of gain 15 per cent.

Swine production in Utah, H. H. Smith (*Utah Sta. Circ. 90 (1930), pp. 28, figs. 11*).—A practical publication dealing with the breeding, feeding, and management of swine.

[Experiments with poultry], C. G. Card (*Michigan Sta. Rpt. 1928, pp. 183, 184*).—In a study of broiler production, it was found that chicks hatched in January can be marketed as broilers at the time of peak prices, which usually comes between March 15 and April 15. Feeding cod-liver oil tended to decrease leg weakness and to hasten maturity of broilers. Barred Plymouth Rocks made the best broilers in this study. It was found that mortality losses must be kept below 15 per cent to insure financial success in this type of broiler production.

As reported by C. M. Ferguson, eggs for hatching that weighed less than 20 oz. per dozen had a very poor hatchability and produced small chicks that did not develop rapidly. Eggs weighing from 21 to 22 oz. per dozen had a fair hatchability and produced chicks weighing a little less than the average. When the eggs weighed 23 oz. or more per dozen the hatchability was good, and the chicks hatched had a good body weight.

It was found by J. L. Boyd that irradiating 450 eggs with a quartz mercury lamp for 15 minutes daily for the first 19 days of incubation produced no ill effects, but that the benefits gained were negligible. Dipping eggs in a disinfecting solution before the beginning of the incubation period tended to reduce the percentage of strong chicks hatched.

Biochemistry and biophysics of the developing hen's egg.—I, Influence of humidity, A. L. Romanoff (*New York Cornell Sta. Mem. 132 (1930), pp. 27, figs. 11*).—The eggs used in this study were all from the same flock, collected

within 3 or 4 days, and held at 10° C. (50° F.) until placed in the incubator. The average weight of the eggs used was 60.9 ± 2.9 gm., and the ratio of length to width was 1.41 ± 0.09. The shell texture of each egg was determined by candling and by observing the external condition of the egg. The eggs were hatched in a special incubator in which temperature, humidity, quality of air, and movement of eggs could be independently and accurately controlled. Standard conditions, with the exception of humidity, were maintained in the incubator. The average temperature was 38 ± 0.2°, the average humidity 60±1 per cent for optimum, and 80.2±0.5 and 40.8±1 per cent for extreme conditions. The inside ventilation was 0.5 cu. ft. per minute, the carbon dioxide content was increased from 0.15 to 0.65 per cent, and the eggs were turned 3 times daily.

The extreme ranges of humidity used had both a direct and an indirect effect upon the developing chick embryo. The direct influence was to hasten growth at high humidity and to retard it at low humidity. The extremes of humidity also decidedly disturbed the cycles of growth (E. S. R., 63, p. 470) of the embryo. At certain stages in the development, the calcium metabolism was much better at high than at low humidity. Mortality was increased, particularly at high humidity, at the nineteenth day of incubation.

Under the indirect influences it was found that the extremes of humidity produced slight changes in the physicochemical constitution of the yolk sac, which probably affected the metabolism of the embryo, leading to low vitality and susceptibility to environment. The water content of the shell membranes and the contents of the allantoic sac corresponded to the humidity conditions, which probably obstructed hatching by restricting the free movement of the embryo and by hindering its pulmonary respiration.

DAIRY FARMING—DAIRYING

Normal variations in the inorganic phosphorus of the blood of dairy cattle, L. S. Palmer, W. S. Cunningham, and C. H. Eckles (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 174–195, fig. 1*).—At the Minnesota Experiment Station 50 cc. of blood was drawn from the jugular veins of animals of all ages, thoroughly mixed with sodium citrate to prevent coagulation, centrifuged to separate the plasma, and an analysis made of the plasma to determine normal variations in blood phosphorus from day to day in samples taken at the same hour on three successive days. An attempt was made to determine the extent to which such physiological factors as eating, drinking, and exercise affected the blood phosphorus.

It was found that the inorganic blood phosphorus of individual cattle may vary markedly from day to day, even when the blood is drawn under apparently identical conditions. There were also indications that the blood phosphorus may vary considerably from hour to hour. Exercise caused first a definite rise, followed by a marked fall which persisted for several hours. Feeding produced a small but significant rise within the first hour, and the value apparently did not return to normal until after about three hours, while normal drinking had no significant effect upon the inorganic blood phosphorus.

Parturition caused a decrease, sometimes amounting to 3.2 mg. per 100 cc. of plasma in the inorganic blood phosphorus. The decrease began the day before calving, the lowest point being reached either before or after parturition. Calf blood at birth was higher in phosphorus content than that of the dam, being approximately equal to the value shown for the dam several days before calving. The inorganic phosphorus content of calves' blood increased

to about six months of age, and then decreased until it reached the normal range for mature cattle.

The feed requirements and the feed cost of the dairy sire, O. G. Schaefer and C. H. Eckles (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 165–173*).—A study at the Minnesota Experiment Station was made to determine the feed cost of maintaining a bull under farm conditions and to ascertain the amount of nutrients necessary to keep the animal in good breeding condition.

The average feed cost of 58 bulls on Minnesota farms at current local feed prices was $69.71, and when pasture and other costs were added the total cost for maintaining a bull was brought to approximately $98 per year. In addition about 37 hours of man labor were required for feeding and caring for the bull. The total digestible nutrients in the feed consumed by six mature bulls in the station herd and the nutrients received by growing bulls fed according to common practice on dairy farms were approximately the same as those prescribed by the Morrison feeding standard for growing dairy cattle of the weights represented.

[Experiments with dairy cattle], O. E. Reed (*Michigan Sta. Rpt. 1928, pp. 179, 180*).—Two experiments are noted in continuation of those previously reported (E. S. R., 61, p. 464).

Testing the feeding value of different mineral supplements.—Adding bone flour to a basal ration of timothy hay, silage, and grain failed to improve the ration. Substituting alfalfa hay for the timothy hay did not improve the body development, milk production, or reproduction of the animals receiving it. Metabolism trials showed that animals on rations low in calcium utilized from 40 to 60 per cent of the calcium present. Post-mortem examination of four animals that had received the basal ration plus a mixture of equal parts of raw rock phosphate and limestone rock showed that the teeth were extremely worn, in some cases down to the gums. A group of five heifers were fed the basal ration plus finely ground limestone rock for a period of 30 months without any ill effects, showing conclusively that the raw rock phosphate was responsible for the worn teeth.

The effect of a ration deficient in lime on calves.—The results of this study indicate that the calcium requirement of calves is much lower than commonly supposed when the ration is otherwise adequate.

[Experiments with dairy cattle at the Montana Station] (*Montana Sta. Rpt. 1929, pp. 64, 70, 71, fig. 1*).—The results of two studies are noted.

Feeding the dairy cow, H. W. Vaughan, W. E. Joseph, and L. Vinke.—Using the reversal method 2 lots of cows were fed through 2 periods of 6 weeks each in 2 different tests. During one period the cows in one group had 3 lbs. of beet molasses substituted for 3 lbs. of barley, and at the end of the period the rations were reversed. In the first test the results indicated that a limited amount of molasses did not reduce the total feed required per unit of milk produced, but did increase slightly the feed per unit of butterfat produced. In the second test the feed requirement per unit of both milk and fat produced was increased slightly by the use of molasses.

[Studies with dairy cattle at the Huntley Substation], D. Hansen and D. V. Kopland.—Good irrigated grass and clover pasture top-dressed with 12 loads of manure per acre per year had an average carrying capacity over a period of 7 years of 2.2 cows per acre for 138 days. A similar pasture not top-dressed had an average carrying capacity over a period of 6 years of 1.4 cows per acre for 135 days.

The results of a study in which a large number of cows have been carried through at least one lactation period on each of three planes of nutrition

showed that the highest production was obtained when the cows were fed 1 lb. of grain for each 3 lbs. of milk produced rather than 1 lb. of grain to 6 lbs. of milk or roughage alone.

A study of the relation between the time a cow is carried in utero and her mature equivalent butterfat production, J. P. LaMaster and E. C. Elting (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 196–202, figs. 2*).—Based on the records of 406 Jersey cows selected from the Register of Merit supplements for 1926 and 1927, including only animals in AA class milked three times daily, and 340 cows selected from the 1926, 1927, and 1928 supplements and including only animals from the same class milked twice daily, the South Carolina Experiment Station attempted to determine whether or not a relationship existed between the length of time a cow was carried in utero and her mature butterfat production.

The results indicated that no relationship existed between these factors. It was also found that the age of the dam did not affect the length of time these cows were carried in utero. The average gestation period for 726 Jersey cows was 278.9 days.

The sterilization of sweet cream for market purposes, B. H. Webb (*Jour. Dairy Sci., 13 (1930), No. 3, pp. 159–164, fig. 1*).—In this paper from the Bureau of Dairy Industry, U. S. D. A., the important factors in the preparation of a sweet sterile cream are discussed. The best procedure was found to consist of preheating 20 per cent cream to 80° C., homogenizing at 3,000 lbs. pressure, cooling, bottling in soda water type bottles, and sterilizing at 118° for from 12 to 14 minutes. This product does not whip readily, but will keep indefinitely without any serious changes in flavor and without separation of butterfat. There was no marked change in the color or viscosity of the cream during preparation or storage.

While the possibilities for preparing a sterile whipping cream were not so favorable, the optimum conditions for the preparation of such a cream were attained when 30 per cent cream was preheated to 80°, homogenized at 2,500 lbs. pressure, and sterilized at 118° for 12 minutes.

Storage properties of sweet cream, starter, and ripened cream butter, O. E. Reed (*Michigan Sta. Rpt. 1928, pp. 181, 182*).—When scored immediately after churning, ripened cream butter scored higher than butter made from cream churned while still sweet, butter made from cream to which was added 0.5 per cent starter, or butter made from sweet cream with starter added in the churn during working. The ripened cream butter was allowed to develop either 0.3 or 0.45 per cent of acidity before churning. After 1 to 3 months' storage the butters to which starter was added scored best, and after 3 months' storage the sweet cream butter scored 2 points lower than the butters to which starter was added. No trace of trimethylamine was found in any of the butters.

VETERINARY MEDICINE

Some diseases of farm animals (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 1 (1930), pp. V+137, pls. 5, figs. 6*).—This is the fourth edition of a practical account.

Bacteriology, particularly bacteriological diagnosis, II, K. B. Lehmann and R. O. Neumann (*Bakteriologie, Insbesondere Bakteriologische Diagnostik. II. Band. Munich: J. F. Lehmann, 7. ed., rev. and enl., vol. 2, 1927, pp. XI+876, figs. 43*).—In this second volume of the work previously noted (E. S. R., 59, p. 278) part 1 (pp. 1–176) deals with general bacteriology and part 2 (pp. 177–791) with special bacteriology.

[Report of work in animal bacteriology], W. GILTNER (*Michigan Sta. Rpt. 1928, pp. 160–166, 167, 168*).—Regarding work by W. L. Chandler (E. S. R., 61, p. 469), it is pointed out that parasites of domesticated, fur-bearing, and wild animals are very prevalent in the State, causing great economic loss. The work of identification and control of intestinal protozoa was largely centered around the control of coccidiosis in poultry and rabbits. Two things were accomplished, (1) the destruction of the infective stage in chick brooder houses and rabbit hutches by scrubbing them with colloidal iodine and (2) the improvement in the condition of birds by the daily feeding of small amounts of colloidal iodine, presumably through assisting the bird to handle the toxins produced by the infection.

The work with parasites of silver foxes and dogs consisted in an attempt to develop a stable and satisfactory capsule of colloidal iodine for dosing them for roundworms and hookworms. Critical dosing experiments in the case of four foxes indicated that two capsules, loaded with stabilized powdered colloidal iodine mixed with mineral oil, were efficient in the removal of both roundworms and hookworms. Laboratory experiments carried out on soil from fox pens in the State indicate that in the case of well-drained sandy soil such as is found in most fox pens in the State if the colloidal iodine is sprayed into the soil and then the soil flooded with water it is possible to accomplish disinfection to a depth of 3 or 4 in.

In continuing experiments with sheep, colloidal iodine suspensoid was used instead of the absorbed iodine product. The most important findings in critical dosing experiments with more than 400 lambs were (1) that the total iodine content of any dose required to destroy all of the stomach worms when administered in such a way as to enter the fourth stomach is approximately 1.2 gm. (2) that when 6 oz. of a dilute suspensoid containing 0.66 per cent I_2 was administered by the drench method it completely destroyed all stomach worms in all lambs in a flock of 16 animals, and (3) that when 4 oz. of a suspensoid containing 1 per cent I_2 and 0.5 per cent copper sulfate was administered by the drench method to a flock of 100 lambs it failed to enter the fourth stomach in only 1 case out of the 100. These results led to the carrying out of field experiments in one of which a flock of 31 lambs, 1 adult buck, and 1 adult ewe, weighing a total of 2,239.8 lbs., were dosed with from 4 to 6 oz. each of iodine suspensoid containing 0.66 per cent I_2. When again weighed 5 weeks later these animals showed a total gain of 630.2 lbs., an average of nearly 20 lbs. each.

In control work with the intestinal worms in poultry, carried out by E. M. Alderman in cooperation with the division of poultry husbandry of the station, it was established that the colloidal iodine suspensoid containing 1.8 per cent I_2 and 4 per cent gum arabic is apparently 100 per cent efficient in killing and removing ascaridia and the various species of tapeworms, thus offering a substitute for the Iodine Vermicide (an iodine-protein compound carrying absorbed iodine), with a possible reduction in cost of about 33 per cent. The results of these and numerous similar experiments are considered to have established the fact that dosing the birds with either the Iodine Vermicide or the colloidal iodine does not throw them off egg production. The results of daily feeding of colloidal iodine to birds in excess of the normal iodine requirements indicate that in cases of intestinal parasitism, either worms or coccidia, a marked improvement in the birds' condition may be brought about. In one experiment a flock of 40 adult birds heavily infested with coccidia and harboring a medium number of roundworms was divided into two nearly equal groups that were fed alike with the exception that one received daily an

average of 5 mg. of iodine in the form of powdered colloidal iodine. At the end of 60 days the control lot showed 6 paralyzed birds and 1 death, and an average loss of weight per bird of 0.51 lb. In the lot receiving the iodine there were no cases of paralysis, no deaths, and each bird showed an average gain of 0.38 lb.

The work with diseases of poultry is next reported upon by H. J. Stafseth and W. L. Mallmann, their work relating largely to pullorum disease. As a result of experimental work in routine observations of over 40,000 agglutination tests for pullorum disease, they conclude that it is no longer necessary to employ a two-tube test. By employing an antigen with a turbidity equal to tube No. 1 of McFarland's nephelometer and containing 2 cc. of a 2 per cent solution of NaOH per 100 cc. of antigen they succeeded in eliminating zone phenomena or pro-agglutinations. As a result, the one-tube test of a serum antigen mixture of 1 : 50 is now employed, thus saving labor and material to the extent of from 25 to 30 per cent. The finding by Mallmann et al. (E. S. R., 60, p. 374) that brilliant green in 1 : 1,000,000 dilution will inhibit the growth of *Escherichia coli* and completely prevent the growth of most contaminating organisms commonly encountered in the tissues and intestinal contents of poultry and yet allow *Salmonella pullorum* to grow unhindered made possible the isolation of *S. pullorum* from the intestinal mucosa and contents where there was a failure to find it in the heart, liver, or kidneys. In badly decomposed specimens cultures of this organism were successfully obtained from the bone marrow of the femur.

It is reported that leukemia is a disease that is becoming very common in chickens in the State. The results of bacteriological and pathological examinations of 1,044 consignments of diseased poultry, including 2,482 specimens, are reported in tabular form. Of 18,747 samples to which the agglutination test for pullorum disease was applied, 2,217 were positive, 1,393 doubtful, 46 cloudy, and 134 unfit.

[Report of work in animal pathology], E. T. Hallman (*Michigan Sta. Rpt. 1928, pp. 152–154*).—This is a brief report of the work under way by the section of animal pathology in cooperation with the section of bacteriology. Researches have definitely shown that *Bacterium abortus* infection in the udder is associated with pathological processes in the udder, and the fact that *B. abortus* is present in the udder of heifers that have never conceived suggests that there may be some relation between udder lesions and sterility in the heifer. In a study of several cases of sterile heifers, in which *B. abortus* and lesions were demonstrated in the udder of some but no infection in the uterus or ovaries, there were changes in the ovary which appeared to be pathological and which may explain sterility in those cases. The ovarian changes consisted of degeneration and disintegration of the stratum granulosum of the developing follicles.

[Report of the department of veterinary science], H. Welch, H. Marsh, and E. A. Tunnicliff (*Montana Sta. Rpt. 1929, pp. 79, 80*).—The completion of a survey of the occurrence of bloat in sheep and cattle pastured on sweetclover indicated that a thick, luxuriant stand is more likely to produce cases of bloat than a scattered, more stemmy growth; that cattle growers may expect a loss of less than 1 per cent on sweetclover pasture; and that sheepmen may expect to lose about 0.5 per cent. No particular system of managing the stock on the pasture seems to have any influence on bloat occurrence.

Examinations made of birds from 32 flocks where leg weakness or various nervous symptoms accompanied the loss of hens showed that either tapeworm or roundworm infestation was the direct cause of the loss. Treatment of tapeworm-infested flocks with 1-gm. kamala tablets brought almost immediate re-

lief, and the use of 1-cc. capsules of tetrachlorethylene was equally effective in the case of a roundworm infestation.

In testing for pullorum disease, the tube method was found much more accurate than the rapid method, largely on account of the unfavorable conditions encountered in poultry-house testing.

The work of the year with lamb dysentery led to the conclusion that the form occurring in Montana differs in so many respects from the English lamb dysentery that the results obtained in Great Britain are of little or no service in controlling the disease in Montana. The dysentery of very young lambs as it occurs in the State is apparently a shed infection, seldom occurring in lambs born on grass in late April or May. Cold, wet weather is the principal factor in the occurrence of the disease, with shed sanitation next in importance. At the close of the lambing season of 1929 no organism had been recovered that could be proved to be the specific cause.

Field observations of a disease known to the owner of the small farm flock as stiff lambs indicated that the disease occurs largely in lambs confined to small pens and sheds during the first two or three weeks of their life, followed by an unusual amount of exercise on pasture.

[Report on the diseases of livestock in Trinidad and Tobago in 1929], H. V. M. METIVIER (*Trinidad and Tobago Dept. Agr. Rpt. 1929, pp. 20–22*).—This report deals in large part with the occurrence of and work with infectious diseases of livestock.

Blood normals for cattle: Some pathological values, J. ALLARDYCE, R. H. FLEMING, F. L. FOWLER, and R. H. CLARK (*Canad. Jour. Research, 3 (1930), No. 2, pp. 120–124*).—This is a report upon samples of cattle blood that have been analyzed and the concentrations of 10 constituents determined, namely, cholesterol, sugar, nonprotein nitrogen, urea nitrogen, amino acid nitrogen, creatine, creatinine, calcium, inorganic phosphorus, and chlorides, the normal range of each of these constituents having been established. The diet of the cattle influences the cholesterol content markedly. Blood samples of cattle suffering from red water and some other pathological cases were examined, and in each case the results showed the variation of the contents of the various constituents.

The details of the work are presented in a large part in tabular form.

Thermocouple for measuring internal body temperatures of animals, S. KARRER and G. B. ESTABROOK (*Jour. Md. Acad. Sci., 1 (1930), No. 3, pp. 129–147, figs. 10*).—After a review presented in connection with a list of 18 references to the literature, a description is given of a thermocouple devised by the authors. It differs from the various types described by previous workers only in details of construction which appear to present some advantages.

Merck's index (*Rahway, N. J.: Merck & Co., 1930, 4. ed., pp.* [7]+585).—This fourth edition, of which the third appeared in 1907, is an encyclopedia for the chemist, pharmacist, and physician, giving the names and synonyms; source, origin, or mode of manufacture; chemical formulas and molecular weights; physical characteristics; melting and boiling points; solubilities; specific gravities; medicinal action; therapeutic uses; ordinary and maximum doses; incompatibilities; antidotes; special cautions; hints on keeping and handling, etc., of the chemicals and drugs used in chemistry, medicine, and the arts, together with an appendix containing reactions of the more important alkaloids and glucosides; characteristic reactions of acids, bases, metals, and salts; and other data.

The value of bone oil as an adjuvant in arsenical dipping fluids, J. LEGG (*Aust. Vet. Jour., 6 (1930), No. 3, pp. 93–98*).—It is concluded that two dippings in a 4-lb. solution allow an occasional tick to escape under circumstances where

there was reason to believe that the fluid was brought into contact with the parasite at the time of both treatments. "Ticks which escape two dippings with a 6- or 8-lb. solution do so under circumstances which point to the probability that such ticks were never brought fully into contact with the solution at the time of both treatments, or else survived the first treatment and reached a resistant stage at the time of the second treatment. Neither difference in 'tickicide' value nor beneficial effect on the animal's skin were noted after the addition of bone oil."

The toxicity of thallium sulphate, J. C. Munch (*Jour. Amer. Pharm. Assoc., 17 (1928), No. 11, pp. 1086–1093*).—In a study made by the U. S. D. A. Bureau of Biological Survey thallium compounds have been found to be very toxic to animals, the minimum lethal doses when fed to rats or intravenously injected into rabbits being 25 mg. of thallium per kilogram of body weight. Although occasionally given to children in doses of 8 mg. per kilogram, it has caused toxic reactions even in doses half that size. Thallium affects the sympathetic nervous system, thereby causing alopecia, pains in the muscles and nerves of the legs, and disturbances of the endocrine glands, particularly the ovaries or testicles. It is cumulative in action; tolerance does not develop in animals. Thallium sulfate has been most commonly employed in the preparation of rat poisons, for which pest it is a certain but not rapid poison. Tables are given showing the toxicity of thallium as sulfate when fed to white rats, and to rabbits when injected intravenously.

A bibliography of 47 titles is included.

The toxicity of thallium sulphate for sheep, I. E. Newsom, J. B. Loftus, and J. C. Ward (*Jour. Amer. Vet. Med. Assoc., 76 (1930), No. 6, pp. 826–832, figs. 3*).—This is a report of work conducted by the Colorado Experiment Station in cooperation with the U. S. D. A. Bureau of Biological Survey, an account of which by Ward has been noted (E. S. R., 63, p. 575). The lethal dose for sheep was found to be about the same as that for other animals as reported by Munch (above noted), the smallest amount that proved fatal being 24.10 mg. of thallium per kilogram of body weight. The least dose that caused shedding of wool was 8.17 mg. of thallium per kilogram of body weight.

Some Australian poison plants—amounts fatal to sheep (*Jour. Council Sci. and Indus. Research [Aust.], 3 (1930), No. 1, pp. 12–24*).—The Lethal Dose of Hydrocyanic Acid for Ruminants (pp. 12, 13) is considered by W. L. Hindmarsh. It appears from tests on 9 animals that hydrocyanic acid administered by intraperitoneal injection is lethal if administered to sheep at the dose rate of 1 mg. per 1 lb. body weight, and from a single test that this rate is highly toxic and nearly lethal for the cow. By intrathoracic injection, hydrocyanic acid was fatal to sheep in one case at a dose rate of 0.6 mg. per 1 lb. body weight. Given per os the lethal dose rate appears to be in the vicinity of 1 mg. per 1 lb. body weight.

The Fatal Dose for Sheep of Cyanogenetic Plants containing Sambunigrin or Prunasin (pp. 14–24) is reported upon by H. R. Seddon and R. O. C. King, who found that the fatal dose of a cyanogenetic plant depends not only on the cyanogenetic content but also upon the amount of enzyme available. "Where adequate enzyme is present the whole of the glucoside may be rapidly hydrolyzed, so that the fatal dose of a cyanogenetic plant is that quantity of the plant which contains cyanogenetic glucoside, the HCN equivalent of which is equal to the minimal fatal dose of HCN for an animal of that weight. Assuming that a sheep may eat on an average 500 gm. of fresh plant, the percentage of HCN which would render such plant able to cause fatal effects would be 0.02 per cent. . . . Dried cyanogenetic plants are commonly deficient in enzyme,

but, as enzyme may be forthcoming from some other foodstuff eaten, dried cyanogenetic plants may be followed by fatal effects."

Innocuity and latency of bacterial spores in the animal body and the factors influencing their development, with special reference to the pathogenesis of black disease, A. W. TURNER (*Aust. Vet. Jour., 6 (1930), No. 3, pp. 83–92*).—It is pointed out that black disease is caused by a localized infection in areas of liver necrosis with *Bacillus oedematiens*, and is apparently always associated with infestation by the liver fluke (*Fasciola hepatica*). It has, however, hitherto been found impossible exactly to reproduce the natural infection. The observations indicate that the normal portal of entry of spores to the body is by way of the alimentary canal. The possible rôle of parasites in this connection is considered. It is concluded that the possibility of the occurrence of the disease in the absence of *F. hepatica*, through the agency of wandering *Cysticercus tenuicollis* or of drugs such as carbon tetrachloride, must be admitted.

The life cycle of the parasite of East Coast fever in ticks transmitting the disease.—Preliminary note, E. V. COWDRY and A. W. HAM (*Science, 72 (1930), No. 1870, pp. 461, 462*).—This is a preliminary report of some results secured in an experimental study of the parasite of East Coast fever in ticks (*Rhipicephalus appendiculatus*) conducted in the Government laboratories at Kabete near Nairobi, Kenya Colony.

The transmission of avian tuberculosis to man and the occurrence of tubercle bacilli in hen's eggs [trans. title], M. KLIMMER (*Berlin. Tierärztl. Wchnschr., 46 (1930), No. 40, pp. 702–710*).—In reviewing the literature, a list of 96 references to which is given, the author finds that since 1893 some 35 cases of avian tuberculosis in man have been recorded in 25 publications. From 3 to 7 per cent of market eggs and about 11 per cent of the eggs from tuberculous fowls contained tubercle bacilli.

Malta, or undulant, fever, H. P. DE FOREST (*Jour. Amer. Med. Assoc., 93 (1929), No. 11, p. 866*).—This brief account calls attention to an article by the author,[2] giving 11 case reports of infectious abortion occurring in women, 2 epidemics in cattle, and 8 cases in dogs thought to be due to *Brucella abortus*.

Undulant fever, with special reference to a study of Brucella infection in Iowa, A. V. HARDY, C. F. JORDAN, I. H. BORTS, and G. C. HARDY (*Pub. Health Rpts. [U. S.], 45 (1930), Nos. 41, pp. 2433–2474, pls. 5, figs. 14; 42, pp. 2525–2572, pls. 2, figs. 2*).—The fourth of the eight parts of this account deals with *B. abortus* infection in animals, reporting upon a study made of herds in Iowa. In a study made of the possible sources of infection data were obtained on 164 herds of cattle and 120 herds of hogs. Serological examinations were also made of 1,300 cattle from 123 herds and 611 hogs from 60 herds.

A bibliography of 100 titles is included.

Answers to questions regarding bovine infectious abortion, R. GRAHAM and F. THORP, JR. (*Illinois Sta. Circ. 360 (1930), pp. 32, pl. 1, figs. 15*).—This is a practical account prepared in the form of questions and answers. It is pointed out that no other infectious disease of cattle has proved to be more widely distributed in Illinois, 1 animal out of every 5 from 100 herds in 85 counties tested in 1928 having reacted to the blood test for the disease.

Studies of vaccination during calfhood to prevent bovine infectious abortion, J. M. BUCK (*Jour. Agr. Research [U. S.], 41 (1930), No. 9, pp. 667–689*).—This is a report of investigations conducted with a view to determining whether a demonstrable and lasting degree of immunity can be engendered

[2] Amer. Jour. Obstet., 76 (1917), pp. 221–254, figs. 8.

in bovines by their vaccination during calfhood rather than at their approach to or attainment of maturity and, secondly, to determine the ability of calves to resist the prolonged or permanent establishment of *Bacterium abortus* infection in their bodies following the subcutaneous administration of the microorganism.

The work, the details of which are presented in large part in tabular form, has led to the conclusion that "it is possible, by the subcutaneous administration of abortion vaccine during calfhood, to engender in bovines an immunity to *B. abortus* infection that is readily demonstrable during their first pregnancies. The immunity afforded by early vaccination, possibly somewhat reinforced by *B. abortus* ingestion exposures, seems to continue through second gestation. Vaccine prepared with a *B. abortus* strain of medium virulence may be preferable to those of very recent isolation or those of long-continued propagation on artificial media for calfhood-immunization purposes. Vaccination during calfhood does not appear to produce effects that are manifested as sterility when the animals arrive at breeding age."

Experimental transmission of bovine anaplasmosis and piroplasmosis by means of an infected lancet, C. W. REES (*North Amer. Vet., 11 (1930), No. 10, pp. 17–20, figs. 2*).—The experiments conducted during the fall of 1929 and spring of 1930 indicate definitely that both anaplasmosis and piroplasmosis may be transmitted from infected to susceptible animals by first pricking the ear of an infected animal with a sharp-pointed scalpel and then pricking the skin of a susceptible animal with the contaminated instrument. It is pointed out that since both anaplasmosis and piroplasmosis may be transmitted by ear pricking nothing can be concluded with reference to the transmission of anaplasmosis that can not equally well be concluded with reference to the transmission of piroplasmosis, so far as these experiments throw light on the subject.

Researches on the treatment of experimental bovine anaplasmosis in Tunis [trans. title], E. DUCLOUX and G. CORDIER (*Compt. Rend. Acad. Sci. [Paris], 191 (1930), No. 12, pp. 502, 503*).—The application of chemotherapy both alone and combined with biological means, and the value of adjuvants, in the treatment of bovine anaplasmosis are briefly dealt with. The authors' observations have led to the conclusion that anaplasmosis is curable provided that treatment is commenced in due time and that the parasiticidal and physiological actions are combined in the reestablishment of the functions affected by the hematozoa.

Haematuria vesicalis, R. H. FLEMING, F. L. FOWLER, and R. H. CLARK (*Canad. Jour. Research, 3 (1930), No. 2, pp. 125–129*).—The analysis of the blood of cattle affected with haematuria vesicalis shows its composition, with few exceptions, to be within the normal range. Two remedies have been found to have a beneficial effect upon cattle suffering from this disease; first, a change of drinking water from surface water to artesian well water, second, the administration of ground coral rock. The surface water, the artesian well water, and the coral rock from the affected areas have been analyzed, and from these analyses certain causes for the improvement above noted have been drawn. Further field experiments are outlined to test these suggestions.

Panting disease of cattle: Poisoning by Zieria smithii (stinkwood), T. PHILP (*Tasmanian Jour. Agr., 1 (1930), No. 4, pp. 161–166, figs. 3*).—An account of a poisonous plant disease of cattle which has for a number of years been a source of great loss in several districts of Tasmania.

In two feeding experiments with stinkwood (*Z. smithii*), 31.25 and 57 lbs., respectively, resulted in the production of typical symptoms of the disease and

death of cattle in 18 days in one case and in 36 days in the other. This poisonous plant produced edema of the lungs and profound changes, particularly in the intestinal canal. It is thought that the deaths from this plant are far more numerous than are realized, and that many cases put down to pneumonia or impaction would, if investigated, have been traced to the influence of it.

Note on the occurrence of "Sarcocystis" in the Philippine carabao (Bubalus bubalis Linn.), F. G. HAUGHWOUT (*Manila: Philippine Bur. Agr., 1928, pp. 8, fig. 1*).—Reference is made to two instances of infection of the carabao with the muscle parasite *Sarcocystis blanchardi*, the first having been detected in 1916 and the second (here reported upon) in 1926.

Caseous lymphadenitis ("cheesy gland," "gland disease") of sheep: Its cause, distribution, means of spread, and suggested methods of control in Australia (*Jour. Council Sci. and Indus. Research [Aust.], 3 (1930), No. 3, pp. 147–155*).—A review of the present status of knowledge of the disease.

A widespread occurrence of xanthin calculi in sheep, T. H. EASTERFIELD, T. RIGG, H. O. ASKEW, and J. A. BRUCE (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 573–585, pls. 2; also in Vet. Jour., 86 (1930), No. 661, pp. 251–265, figs. 5*).—The occurrence of xanthin calculi in the kidneys of sheep on certain poor pastures on the Moutere Hills in the Nelson district in New Zealand is reported and described. The incidence of xanthin calculi is associated with poor stock results over large areas. Poor lambing returns, high mortality of stock in certain seasons, low milk yields, and inability to fatten stock are common features of many farms on the Moutere Hills soil. On one small farm, grazing 120 sheep, no less than 12 which died or were killed during the preceding 6 months had calculi in the kidneys.

Observations upon the nature of the virus of hog cholera, C. W. DUVAL (*Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 2, pp. 87–89*).—The author records certain observations of the hog cholera virus made during the course of an experimental study.

Observations on equine dhobie itch of the Philippines, F. H. K. REYNOLDS, J. S. SIMMONS, and J. H. ST. JOHN (*Philippine Jour. Sci., 42 (1930), No. 2, pp. 337–345, pls. 4*).—This is a report of studies of a skin infection known as dhobie itch, which is an annoying and relatively important disease of horses and mules in the Philippine Islands.

Microscopic and culture examination of 221 specimens from typical lesions and cutaneous inoculation of guinea pigs failed to substantiate the general impression that the condition is caused by a trichophyton. "*Staphylococcus albus* was present in all cultures, *S. aureus* in a smaller proportion, and *S. citreus* in a few. The fact that the condition is most apt to occur in animals living in the open or stabled in unscreened stalls, particularly near swampy or brush covered ground, and is most prevalent during the warm rainy season, together with the fact that protection of portions of a horse's skin from insects by covering it with a canvas jacket prevented the development of lesions, while unprotected areas became infected, seems to point to an insect cause. During this investigation it has been shown that severe, long-standing cases of dhobie itch can be cured in a short time without any medication or grooming by the simple procedure of placing the infected animal in an insect-free screened stall at night."

The vaccination of animals against rabies, P. V. HUYEN (*La Vaccination Antirabique chez les Animaux. Paris: Pierre Bossuet, 1930, pp. [8]+186*).—Part 1 deals with the nature of the rabies virus (pp. 5–18), part 2 with methods of vaccination (pp. 19–58), part 3 with investigations conducted by the author on the preventive immunization of the dog by a glycero-formol

vaccine (pp. 55–60), part 4 with the accidents and dangers of and the obstacles to vaccination (pp. 61–84), and part 5 with the practice of antirabic vaccination (pp. 85–108).

A 10-page list of references is included.

On a severe infection of dogs in Cairo simulating rabies.—Preliminary note, M. CARPANO, trans. by E. TALAREWITCH (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 92 (1930), pp. 19, pls. 2*).—This report relates to infective bulbar paralysis, also known as pseudorabies or Aujeszky's disease.

Some diseases of poultry (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 6 (1930), pp. V+46, pls. 9*).—A practical account of the more important diseases of poultry occurring in Great Britain.

The transmission of coccidiosis, J. M. MOORE (*Michigan Sta. Rpt. 1928, p. 184*).—Four lots of chicks were used, lot 1 being placed in a house and run screened from flies, while lots 2, 3, and 4 had outside runs on soil known to be infested with coccidiosis. Lots 2 and 3 were fed varying amounts of powdered buttermilk, while lots 1 and 4 had no supplements added to the basal mash. The best gains in weight and the lowest mortalities were obtained in lots 2 and 3. These lots contracted coccidiosis much quicker than lot 1, but due to the addition of the dried buttermilk their development was not delayed. Mortality was quite heavy in lot 4. Lot 1 was the last to contract the disease, but the mortality was heavy. Adding 30 per cent of powdered buttermilk to the starting mash of 2,000 range chicks that had contracted the disease checked the mortality and hastened the recovery.

On the transmissibility of the leucemia of fowls, J. FURTH (*Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 2, pp. 155–157*).—This is a report of transmission experiments in which the blood from a Barred Rock chicken that had been injected and developed severe anemia in about 2.5 months was used for subinjections into 6 others. In about 8 weeks 1 of the 6 injected chickens developed a disease identical with that of the donor of the blood, and 2 of the others, 1 in about 6 weeks and 1 in 11 weeks, showed an enormous increase of the white blood cells in the blood stream. Two further passages are being followed. Of 12 birds injected 10 weeks previously with blood or with organ emulsions of 1 of the fowls afflicted with myeloid leucemia, 1 developed myeloid and a second erythroleucemia.

Paralysis of fowls (neuro-lymphomatosis gallinarum), J. R. BEACH (*North Amer. Vet., 11 (1930), No. 10, pp. 49–54, figs. 2*).—This is a brief review of the present status of knowledge of the disease.

A practical method of vaccination for controlling fowl pox, D. F. KING and G. A. TROLLOPE (*Ala. Polytech. Inst. Ext. Circ. 126 (1930), pp. 8, figs. 5*).—An account is given of the application of the stick method of vaccination with the live virus described by Johnson (E. S. R., 62, p. 473).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Montana Station], H. E. MURDOCK ET AL. (*Montana Sta. Rpt. 1929, pp. 18–23, figs. 7*).—In the tractor farming study 120 individual mechanical tests of 11 tractors and a great variety of farm implements indicated that for efficient work these tractors should be operated at about their rated power capacity. At such full-load capacity the fuel cost per acre is at the minimum and the acres covered per hour at the maximum, thus reducing labor, overhead, interest, and depreciation costs per acre.

Investigations of haystack weight and measurement, involving 600 stacks of hay, resulted in the development of a volume formula $V=\frac{W}{2}(O-\frac{5}{8}W)L$, in which V is the volume in cubic feet, W is the width, O is the over, and L is the length of the stack in feet. For the average stacks as built in Montana this formula gives the volume within 1 per cent of the correct value for 45 per cent of all stacks measured. Eighty-one per cent of all stacks measured fall within 2 per cent, and 96 per cent of all stacks measured fall within 3 per cent of the value calculated.

A study of irrigated v. dry farming below the ditch showed that when the overhead cost per acre is not increased by high water charges, most farm crops can be produced at a lower unit cost with the aid of irrigation than where water is not used.

Data on tractor hitches are also included.

Irrigation requirements of the arid and semiarid lands of the Columbia River Basin, S. FORTIER and A. A. YOUNG (*U. S. Dept. Agr., Tech. Bul. 200 (1930), pp. 56, figs. 7*).—This bulletin is one of a series on the irrigation requirements of the arid and semiarid lands of the Western States, and deals with that portion of the Northwest which is drained by the Columbia River and its tributaries. A part at least of the investigations upon which it is based appear to have been conducted in cooperation with the Oregon, Washington, and Idaho Experiment Stations, and with the Department of Agriculture of the Dominion of Canada.

Data are presented on the soils, climate, water resources, agricultural resources, and irrigation practices in the basin, and on the amounts of water required for crops and the conditions influencing them. A bibliography of 34 references is included.

Surface water supply of the United States, 1927, VI, VIII, X (*U. S. Geol. Survey, Water-Supply Papers 646 (1930), pp. VI+216, fig. 1; 648 (1930), pp. V+117, fig. 1; 650 (1930), pp. V+97, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1927, No. 646, prepared in cooperation with the States of Montana, Wyoming, Colorado, Missouri, and Kansas, covers the Missouri River Basin; No. 648, prepared in cooperation with the State of Texas, the western Gulf of Mexico basins; and No. 650, prepared in cooperation with the States of Utah, Nevada, California, Oregon, and Wyoming, the Great Basin.

The ground water of Middle Rio Grande Valley and its relation to drainage, D. W. BLOODGOOD (*New Mexico Sta. Bul. 184 (1930), pp. 60, figs. 22*).—This bulletin is based on investigations conducted cooperatively by the U. S. D. A. Bureau of Public Roads, the State engineer of New Mexico, and the station. It reports investigations of the cause of the rise of the ground water table in the Middle Rio Grande Valley and of its behavior, and presents information obtained as to plans for reclamation.

It was found that soil structure and texture influence the fluctuation of the ground water. In tight soils the fluctuation is less than in the more porous soils. The ground water slope appears to flatten out in the more porous soils. The ground water table is lower in the heavier sandy loam soils than in the sandy soils. The crests and troughs of the lateral underground water are spaced more uniformly in the more porous soils than in the tighter textured soils. The general effect of the heavier soils of clay or clay loam on the ground water table is negligible. The ground water slope conforms generally to surface topography, regardless of soil texture. Precipitation, evaporation, and temperature appear to have little or no influence upon the fluctuation of

the ground water, but there is direct relationship between variations in river surface levels and the fluctuations of the ground water table.

West of the Rio Grande 64 per cent of the seepage water was from the river and 36 per cent from the foothill area, while east of the Rio Grande 58 per cent of the seepage water was from the river and 42 per cent from the foothill area. When the ground water once becomes high it is slow to recede, and natural underground drainage is not sufficient to lower the ground water quickly. Some preliminary data are given which might assist a drainage engineer in planning a drainage system.

The principles of underdrainage, R. D. WALKER (*London: Chapman & Hall, 1929, pp. XXIV+223, pls. [14], figs. 70*).—This book deals with the broad principles of underdrainage in its various branches. "It has been prepared with the aim of placing an engineer in possession of facts which should enable him to design satisfactory underdrainage, each design being treated on its own merits and due allowance being made for the various factors involved."

Chapters are included on definitions and principles, underground waters, the theory and uses of underdrainage, underdrains and their location, antimalaria drainage and its objects, the underdrainage of ravines, flat lands, and land underlain by shale, the drainage of cuttings by means of pipe underdrains, underdrainage for the prevention of slips and subsidences, the economics of underdrainage, underdrainage estimates, construction of pipe underdrains, the maintenance of underdrains, open drains and their uses, maximum flood discharges, and the flow in pipe underdrains. Five appendixes are included relating to notes on clay, capacity charts for pipe underdrainage, identification of Anopheline and Culex mosquitoes, water requirements of agricultural land, and schedule of rates for underdrainage and allied works in operation in Kuala Lumpur, F. M. S., in 1928.

Soil erosion—a local and national problem, C. G. BATES and O. R. ZEASMAN (*Wisconsin Sta. Research Bul. 99 (1930), pp. 100, figs. 63*).—This bulletin reports the results of an investigation of soil erosion made by the station in cooperation with the Lake States Forest Experiment Station of the U. S. D. A. Forest Service. The region studied embraces three counties in the unglaciated section of southwestern Wisconsin, and to a very small extent the Minnesota territory adjacent, in the vicinity of Winona.

The results indicate that the most immediate and direct cause of destructive erosion is soil disturbance, that is, a disturbance of any kind of the natural balance between gravitation and the binding power of roots tending to hold the soil in place, and on the other hand the force of running water tending to move it.

The formation of deep gullies may nearly always be traced to a disturbance of soil on or at the foot of steep slopes of such a nature as to create a direct fall for any run-off which may be concentrated at that point. The checking of gully cutting requires that the fall and cutting power of the water be decreased until it becomes negligible. This is accomplished (1) by complete diversion of the water to another channel, (2) by providing an artificial channel at the fall such as a flume or pipe or even the sloping face of a dam, or (3) by raising the level of the floor of the gully by means of soil-saving dams. Sheet erosion is primarily the result of the soil disturbance which attends any form of cultivation. The most certain preventive of erosion is to keep the soil continuously covered with vegetation.

From all the evidence available on conditions of run-off in southwestern Wisconsin, the belief is expressed that the economic interests of the individual farmer and of the community would be best served if it were required that all slopes of more than 25 per cent gradient be kept in timber and protected from

fire and overgrazing, and if slopes of greater gradient than 15 per cent were only rarely plowed.

It is also considered best to terrace pastures with rather deep terraces not provided with outlets, to fertilize pastures and build up the humus content of the soil, and to avoid "puddling" of the surface of pastures, which results primarily from trampling, by keeping stock off the ground when wet, especially in the early spring.

Public Roads, [October–November, 1930] (*U. S. Dept. Agr., Public Roads, 11 (1930), Nos. 8, pp. 153–172+[2], fig. 1; 9, pp. 173–188+[2], figs. 9*).—These numbers of this periodical contain, respectively, the status of Federal-aid road construction as of September 30 and October 31, 1930, together with the following articles:

No. 8.—General Reports Submitted to International Road Congress: Results Obtained by the Use of Cement, by F. T. Sheets (pp. 153–155); Results Obtained by the Use of Bricks or Other Certified Paving, by P. J. Freeman (pp. 156, 157); The Most Recent Methods Adopted for the Use of Tar, Bitumen, and Asphalt in Road Construction, by R. W. Crum (pp. 157, 158); The Construction of Roads in New Countries, such as Colonies and Undeveloped Regions, by E. W. James (pp. 158–160); Ways and Means of Financing Highways—(A) Road Construction, (B) Maintenance, by A. B. Barber (pp. 160–165); Highway Transport—Correlation and Coordination with Other Means of Transport; Adaptation to Collective (Organizations) and Individual Uses, by H. R. Trumbower (pp. 165, 166); and (1) Traffic Regulation in Large Cities and Their Suburbs; Traffic Signals; Design and Layout of Roads and Adaptation to Traffic Requirements in Built-Up Areas; (2) Parking and Garaging of Road Vehicles, by M. M'Clintock (pp. 166, 167); International Road Congress Adopts General Conclusions (pp. 167–172); and Bureau of Public Roads Enters upon New Research Programs (p. 172).

No. 9.—Cooperative Survey of Corrugated Metal Culverts on the Austin-San Antonio Post Road, by E. F. Kelley (pp. 173–181, 184); Methods for the Measurement of Water for Cement Briquet Tests, by F. V. Reagel and D. O. Woolf (pp. 182, 183); and Results Obtained by the Use of Cement, by F. T. Sheets et al. (pp. 184–188).

Distillate as a tractor fuel, H. F. McColly (*N. Dak. Agr. Col. Ext. Circ. 94 (1930), pp. 8, fig. 1*).—Studies are reported the results of which indicate that the first requisite for using distillate in tractor motors is that the motors operate smoothly on it. Motors having oiling systems of the internal circulating type should have a ventilated crank case.

One of the main factors governing the use of distillate is that its sulfur content should not be too high. The specification limit should permit not more than about 10 per cent more than that of kerosene, or 0.138 per cent sulfur in the distillate.

Distillate fuel costing 9 cts. per gallon will save approximately 15 to 20 cts. per hour in the fuel cost of the average 3- to 4-plow size tractor when compared with kerosene costing 15 cts. per gallon. The savings in fuel costs by using distillate have in many cases been expended in repairs and adjustments, largely due to the damage done to the motor by excessive sulphur content in the distillate or improper motor adjustment and improper operation.

A maize stalk shredder, H. J. Hopfen (*Internatl. Rev. Agr., Mo. Bul. Agr. Sci. and Pract. [Rome], 21 (1930), No. 3, pp. 100, 101, figs. 3*).—A machine which shreds and defibrates cornstalks for feed is briefly described, based upon the results of experiments conducted in Hungary. It consists essentially of a cylinder and concave. The cylinder consists of a central shaft with four disks

connected by crosspieces between which are the lacerating teeth. The inside diameter is 61 cm. (24 in.), the width is 107 cm., and the speed is 1,180 r. p. m.

The best results are obtained by treating the stalks as soon as possible after cropping, while they still retain their moisture. The corn borer is thus effectively controlled, since the larvae are killed either during shredding or during acidification in the silo afterwards. In addition to cornstalks, gourds, potatoes, fodder beet and sugar beet tops and roots can be cut up for silage.

The Gehl laboratory rice-scouring device, R. M. Gehl (*U. S. Dept. Agr. Circ. 136 (1930), pp. 12, figs. 5*).—The construction and operation of this laboratory equipment are described and illustrated, and construction specifications are included.

Progress in the artificial dehydration of forage crops in the United States, H. B. Josephson (*Agr. Engin., 11 (1930), No. 9, pp. 295–299, figs. 4*).—In a contribution from the Pennsylvania Experiment Station a review is given of investigations by the U. S. Department of Agriculture and several of the State agricultural experiment stations on the artificial drying of forage crops, and several commercial hay driers are described. The commercial driers are classed as conveyor, tray, and rotary kiln types.

Silage and the trench silo, R. C. Miller and F. W. Christensen (*N. Dak. Agr. Col. Ext. Circ. 93 (1930), pp. 42, figs. 27*).—This bulletin reports experiments and farm experience in the design, construction, and use of the trench silo, with special reference to North Dakota conditions. The findings are presented in terms of practical information and working drawings. Practical information also is given on silage and silage making.

Factors affecting tank type milk coolers, E. M. Knepp (*Agr. Engin., 11 (1930), No. 9, pp. 301–303, figs. 3*).—Experiments conducted at the Indiana Experiment Station with five different makes of tanks and machines for milk cooling are reported. Studies were made on the effect of agitation of the cooling water on the rate of cooling, the rate of growth of bacteria in the milk, the cost of operation, and the amount of refrigeration lost through the sides of the tank in 24 hours.

It was found that the use of the agitator greatly increases the rate of cooling obtained by tank-type coolers. It is possible to cool milk from 95° to 60° F. and below in the tank-type coolers, using the agitator, in the same time that is required to obtain the same temperature in surface-cooled milk placed in a tank without agitation.

When the tank operated at 45°, the agitator greatly reduced the rate of growth of bacteria. Operating the tank at 35° greatly increased the cost of operation and would not be justified except where the dairyman received a good bonus for his milk or had to ship it long distances.

The number of kilowatt-hours used for each 100 B. t. u. of heat removed varied with the different machines and temperatures to which the milk was cooled from 0.0583 to 0.0123.

Even in well-insulated tanks the refrigeration lost through the sides of the tank was from 48 to 90 lbs. of ice for each 24 hours.

Housing farm poultry, W. C. Tully (*N. Dak. Agr. Col. Ext. Circ. 92 (1930), pp. 12, figs. 2*).—Practical information is given on the subject with special reference to North Dakota conditions. Working drawings are included.

The South Dakota poultry house, R. L. Patty (*S. Dak. Agr. Col. Ext. Circ. 295 (1930), pp. 16, figs. 10*).—A brief description is given of the plan of this poultry house.

Electricity for poultry raising, H. E. Lacy (*Ga. Agr. Col. Bul. 391 (1930), pp. 24, figs. 11*).—Practical information is presented on the use of electricity for

lighting laying houses, incubation, brooding, feed grinding and mixing, and water heatings.

Farm house conditions and needs, D. G. CARTER (*Agr. Engin., 11 (1930), No. 9, pp. 304–306, figs. 3*).—In a contribution from the Arkansas Experiment Station data are reported which represent averages of 515 typical established farm homes in 5 areas of Arkansas. These indicate that quality of housing, as measured by size and equipment, tends to increase with an increase in the size of farm. There is a distinct increase in facilities and size of house on farms of 120 acres and over. No definite trends of location were found.

House construction is typically frame, with a lack of basement, storage, and kitchen cabinet space. One-half of the houses have insufficient foundations. The natural and artificial lighting is inadequate as compared to usual standards. The better homes are partially equipped with labor-saving and convenience facilities. In general, however, provision for sewage disposal, safe running water supply, and power appliances represents a major problem.

The average age of the houses is 22 years, with a probable new construction of about 2.5 per cent of the total each year. The average length of residence in one house is 12 years. Owner homes are occupied by three or more families during the useful life of the house. Tenant families change each 3 years as an averege.

The farm houses average 250 sq. ft. smaller in floor area than typical commercial plans. One-fifth are obviously inadequate in size. The average is 1,169.74 sq. ft. The majority of the houses have 4, 5, or 6 rooms each, with 5.35 rooms the average. This is approximately 1 room per person, based upon averages, but there is no correlation between size of house and size of family. Sleeping room space is insufficient. In 27 per cent of the cases the living room counted as a sleeping room, and 150, or nearly one-third, of the families had less than one sleeping room for each two persons.

[Bacterial control of well and swimming pool waters], W. L. MALLMAN (*Michigan Sta. Rpt. 1928, pp. 166, 167*).—Well waters were examined, and the effect on the bacterial conditions of a swimming pool produced by chlorinating the water from an apparatus using liquid chlorine was recorded. The apparatus provided a continuous dosage of chlorine during the use of the pool. A residual chlorine content of 0.2 part per millon was maintained and checked twice daily by means of the orthotolidine test. As a result, "the *Escherichia coli* incidence in both the five 10-cc. samples, and the five 1-cc. samples has been zero throughout the year. The bacterial count has been kept below 10 per cubic centimeter except once when the attendant of the pool was ill. At that time the total count went up to 8,000 per cubic centimeter, due to lack of sufficient chlorine."

Fire safeguards for the farm, V. N. VALGREN, H. E. ROETHE, and M. C. BETTS (*U. S. Dept. Agr., Farmers' Bul. 1643 (1930), pp. II+22, figs. 4*).—This supersedes Farmers' Bulletin 904 (E. S. R., 38, p. 492). It tells how to avoid or lessen fire hazards on the farm, describes simple fire-extinguishing equipment, and points out the need for organized and well-equipped rural fire departments.

RURAL ECONOMICS AND SOCIOLOGY

Farm Economics, [August, 1930] (*N. Y. Agr. Col. (Cornell), Farm Econ., No. 67 (1930), pp. 1329–1416, figs. 2*).—Included are a series of articles on agricultural problems in different countries of the world contributed by agricultural economists of the several countries as follows: Business Conditions [in the United States], by G. F. Warren (pp. 1330–1339); Argentine Agriculture, by

T. Brinkman (pp. 1339–1341); Agriculture in the Union of South Africa, by A. P. van der Post (pp. 1341–1344); The Present Agricultural Situation in England, by C. S. Orwin (pp. 1344–1346); Governmental Aid to Assist Agriculture in Great Britain, by T. H. Middleton (pp. 1346–1348); Government Protection and World Crisis in Agriculture, by W. Bauer (pp. 1348–1351); The Extension of World Production in Agricuture, by K. Ritter (pp. 1352–1355); Increasing the Purchasing Power of the Farmer, by J. E. Lattimer (pp. 1355–1357); Difficulties in Connection with Farm Management Research in the Union of South Africa, by J. C. Neethling (pp. 1357–1359); Costs of Producing Milk in Wales, by J. P. Howell (pp. 1359–1361); Farm Management Problems in the Prairie Provinces of Western Canada, by W. Allen (pp. 1361–1365); Farm Tenancy in China, by C. C. Chang (pp. 1365–1369); Social Income Furnished by an Agricultural Undertaking, by E. Laur (pp. 1370–1372); The World Wool Situation, by H. Stoker (pp. 1373–1375); Diversified versus Specialized Farming for the Philippines, by F. M. Sacey (pp. 1375, 1376); Agriculture and the Gold Problem, by E. M. H. Lloyd (pp. 1377, 1378); The Movement in Farm Prices and the Cost of Living in Great Britain and the United States, 1913–29, by K. A. H. Murray (pp. 1379, 1380); The Dynamics of Prices of Industrial and Agricultural Commodities, by N. D. Kondratieff (pp. 1380–1385); Supplies and Prices of Wheat on Ipswich Market, England, 1820–1850, by R. C. Hinton (p. 1385); The National Mark, by A. W. Street (pp. 1386, 1387); Wheat Marketing in Australia, by P. C. Campbell (pp. 1388–1390); State Regulation and the Marketing of Northern Ireland Agricultural Produce, by D. A. E. Harkness (pp. 1391, 1392); Trends in Canadian Co-operation, by J. T. Hull (pp. 1393, 1394); Co-operation in New Zealand, by R. M. Campbell (pp. 1395, 1396); Co-operative Tendencies in British India, by C. F. Strickland (pp. 1396–1398); The Concentration of German Agricultural Co-operatives, by E. Kraemer (pp. 1398–1401); Agricultural Cooperative Credit in Czechoslovakia, by S. Borodaevsky (p. 1402); Rural Credit in China, by P. C. Hsu (pp. 1403, 1404); The Deutsche Rentenbank, by Seelman (pp. 1405–1407); Roads and Farmers in New Zealand, by R. M. Campbell (pp. 1407, 1408); The Canadian Society of Agricultural Economics, by W. V. Longley (pp. 1409, 1410); Farm Management Surveys in China, by J. L. Buck (pp. 1411–1414); and Agricultural Education in Germany, by J. J. W. Seedorf (pp. 1414–1416).

[Investigations in agricultural economics at the Montana Station, 1928–29], M. L. Wilson et al. (*Montana Sta. Rpt. 1929, pp. 11–14, 15–17, figs. 3*).—Results of experiments on level sandy loam land on the Lone Warrior farm near Brockton of the Fairway Farms Corporation are reported on as follows:

Two years' investigations indicate that using a 50 per cent crop and 50 per cent summer fallow (one-half of the fallow plowed and one-half plowless) system, the economic size of land unit, cash operating cost including fuel, labor, seed, and depreciation, man labor requirements per acre of crop harvested, and cost of equipment combination per acre for different sized tractor outfits were for 3-plow unit, 800 acres, $7.77, 3 hours and 10 minutes, and $5,50, respectively; 4-plow unit, 1,200 acres, $6.62, 2 hours and 32 minutes, and $5; and 6-plow unit, 1,800 acres, $4.65, 1 hour and 48 minutes, and $4.50.

Actual operating costs per acre in 1929 on tracts of approximately 100 acres each summer fallowed by different systems were for (1) plowed fallow (plowed and duck-footed 3 times) $2.80, (2) 50–50 system (one-half plowed and one-half duck-footed and then all duck-footed 3 times) $2.16, (3) one-way disk fallow (use of one-way disk for 2 operations and duck-footed 2 times) $1.85, and (4) plowless duck-foot fallow (stubble burned in the spring and duck-footed 4 times) $1.50.

In 1929, 160 acres of wide-spaced corn on land which would otherwise have been black fallowed was raised at an additional cost per acre over summer fallowing of 20 cts. for seed and 30 cts. for planting. The returns were valued at $3 per acre with a below normal yield, due to a very dry year.

In 1928 flax and spring wheat on summer fallow gave practically the same returns. In 1929, a very dry year, the returns from wheat were approximately $1.30 per acre the larger. On second-year fallow where the stubble was burned in the spring, the returns from flax were $2.30 the larger in 1928 and $3.45 in 1929.

A study of the business, operation, and management records for 1928 from 60 typical sheep ranches scattered over the State and representing 250,000 sheep showed the income per head to be from wool $3.34, lambs $3.91, other sources 65 cts., total $7.90, and the expenses $6.03. The profits, after deducting 60 cts. per head for operator's labor and management, represented a return of 4.5 per cent on the net capital invested.

Soil: Its influence on the history of the United States, A. B. Hulbert (*New Haven: Yale Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1930, pp. XIII+227, pls. 7*).—The main theme of this book, as stated in the preface, "is the quite ignored one of the influences of the soil on American settlement and expansion." The book is, however, somewhat broader in scope than this would indicate, in that it presents "illustrations of how geological, climatic, hydrographic, and edaphic factors have been and may be used to clarify history, particularly the history of American occupation and expansion," and in a measure explains certain important features of economic, social, and political development of the chief pioneer American settlements and courses of expansion.

Russian agriculture during the war, A. N. Antsiferov et al. (*New Haven: Yale Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1930, pp. XVII+394, figs. 2*).—This publication of the Carnegie Endowment for International Peace includes a monograph on Russian Rural Economy during the War, by A. N. Antsiferov, A. D. Bilimovich, M. O. Batshev, and D. N. Ivantsov (pp. 1–300), and one on The Land Settlement in Russia and the War, by A. D. Bilimovich (pp. 301–388).

The first monograph describes the state of agriculture in Russia at the opening of the twentieth century, the fundamental lines along which it was tending to develop, and its place in the general scheme of world economics, and reviews the war period and the changes that took place in the whole system of agricultural production and in the position of Russian agriculture in relation to home and foreign markets. The second discusses the defects in the agrarian organization before 1906, the land reform of 1906-1913, and the effects of the war and the revolution of 1917 on land settlement.

Land reform in Rumania, O. Gorni (*Internatl. Labor Off. [Geneva], Internatl. Labor Rev., 22 (1930), No. 4, pp. 445–482*).—The economic, social, and political causes leading up to the reform, and the nature, extent, and results of the reform are analyzed and discussed.

An economic study of the agriculture of the Connecticut Valley.—III, Tobacco farm organization, C. I. Hendrickson (*Connecticut Storrs Sta. Bul. 165 (1930), pp. 107–143, figs. 10*).—This bulletin is a continuation of the series previously noted (E. S. R., 55, p. 286), and reports the results of a study of tobacco farms in the towns of East Windsor and Ellington (Broadleaf area) in the fall and winter of 1925–26, and in the towns of East Granby, Suffield, and Windsor Locks (Havana Seed area) in the spring of 1927. Of the farms studied in the Broadleaf area, 159 were specialized tobacco farms, 26 tobac-

dairy farms, 28 dairy-tobacco farms, and 20 tobacco-miscellaneous farms. In the Havana area, the numbers of farms by different types of farming were 137, 68, 31, and 5, respectively. The average price for tobacco was 19 cts. per pound in 1925 and 26 cts. in 1926.

Tables are included and discussed showing the acreages of tobacco and other crops and the number of cows on farms of different sizes, and the receipts, expenses, and incomes of the farms grouped by types of farming. The effects of type of farming, size of business, combination of enterprises, receipts per acre of tobacco, cost of fertilizer per acre, and labor efficiency on income are discussed. Some of the findings of the study follow:

In both of the years specialized tobacco farms returned the least and dairy-tobacco farms the highest income, but with tobacco prices over 30 cts. for a period of years the farms with a larger proportion of tobacco would be the more profitable. Even in 1926, the average income was not much above that of Connecticut farm hands. Of the farmers depending on tobacco alone, more than half did not have sufficient acreage to give an income greater than farm hand's wages, even with 1926 prices. In a year when tobacco prices yield a profit (around 25 cts. per pound), farmers with less than 5 acres of tobacco should have 16 or more cows to return a fair income; those with 6 to 10 acres, 11 to 15 cows; and those with 11 to 15 acres, 6 to 10 cows. Farmers with 1 to 5 acres of tobacco increased their incomes by adding 30 or 40 acres of other crops. Better quality, higher yields, or better marketing methods gave some farmers more than average incomes. Increasing the fertilizer cost per acre resulted in lower incomes in all but one of the groups studied.

Multiple correlation analysis was made for each year of the effect on income of the number of acres of tobacco, value per acre of tobacco, days of outside work, value of fertilizer per acre, and man work units per man on the specialized tobacco farms, and of the same factors, together with the number of cows and the sales of milk per cow, for the tobacco-dairy and dairy-tobacco farms.

The range cattle industry, E. E. Dale (*Norman: Univ. Okla. Press, 1930, pp. XVII+19–216, pls. 6, figs. 19*).—"A history of the growth and subsequent decline of the ranch industry on the Great Plains and of the establishment and development of relations between that region and the Corn Belt farther east."

Economic and social aspects of Federal reclamation, D. Lampen (*Johns Hopkins Univ. Studies Hist. and Polit. Sci., Ser. 48 (1930), No. 1, pp. XI+13–125*).—Legislation pertaining to irrigation and irrigation development under the Reclamation Service in the United States is traced, and the need of financial aid to settlers, cooperative development on Reclamation Bureau projects, and the legislative efforts to provide aided and directed settlement on such projects are discussed.

The activities of the Federal Farm Board in the United States (*Econ. Jour., 40 (1930), No. 157, pp. 69–78*).—This is a memorandum compiled by the Standard Statistics Company of New York for the information of its subscribers.

[Reports of the Rural Intermediate Credit Board for the years ended June 30, 1928, 1929, and 1930], J. W. Macdonald (*New Zeal. Rural Intermed. Credit Bd. Rpts. 1928, pp. 26; 1929, pp. IV+39; 1930, pp. III+43*).—These are the first three reports of the operations of the board under the Rural Intermediate Credit Act, 1927, and cover the years ended June 30, 1928, 1929, and 1930, respectively. The organization and administration of the board are described, and the loans to members of cooperative rural intermediate credit associations, the discounting of suitably indorsed promissory notes made by farmers, the loans made direct to farmers submitting satis-

factory proposals for independent guaranties supporting their applications, and other operations under the act are discussed.

Forecasting of crops, A. A. Watson (*Agr. Gaz. N. S. Wales, 41 (1930), No. 10, pp. 755–759*).—This article discusses "the American system of crop reporting," which is characterized as "a large-scale, long-established, and highly effective scheme whereby the farmers and general public of that country are in a position to benefit by monthly crop bulletins covering crop conditions, prospects, and, at the proper time, soundly-based estimates of yields," and explains what is being undertaken along similar lines in New South Wales "to establish crop forecasting as an essential and statutory service." Forecasts of yields of apples, pears, corn, citrus fruits, potatoes, wheat, and honey flow are being attempted on the basis of the reports of "honorary" crop correspondents of the State Marketing Bureau.

A study of the cost of transportation of Florida citrus fruits with comparative costs from other producing areas, M. A. Brooker (*Florida Sta. Bul. 217 (1930), pp. 128, figs. 28*).—Tables and charts are included and discussed showing the production of citrus fruits in different countries, ocean transportation costs, the development of the citrus industry in the United States, and the percentage of unloads at 66 markets of the United States in 1927 and 1928 of oranges and grapefruit shipped from Florida, California, and other areas of the United States. An analysis is made of the freight rates, 1924–1927, from different origin groups in Florida to 7 of the leading markets and from a representative shipping point in each producing State to the 36 largest markets in the United States. The rates from the several producing sections, changes during 1928 and 1929, ton-mile costs for freight, changes in freight rates on citrus fruits other than lemons from Florida and California since 1900, methods of shipping citrus fruits, costs of different services on shipments from different sections, water transportation costs from Florida, and the relation of farm prices of Florida oranges and grapefruit to the general price level and to freight rates from 1910–11 to 1928–29 are discussed.

No specific conclusions are drawn as to whether Florida or California fruit has the better freight rate per box, due to the fact that the rate structures for the two areas are entirely different, the Florida rate increasing approximately $21 per car for each 100 miles increase in distance, while the California rate either does not increase or increases only slightly for points east of the so-called transcontinental line over the rate to Denver, Colo. The blanket rate structure on California fruit makes it possible for diversions and reconsignments to be made easily and is deemed largely responsible for the fine geographical distribution of California fruit and also for a much lower ton-mile cost on such fruit than on Florida fruit. The Florida and California rate increases and decreases followed each other closely from 1900 to 1923, and the index numbers of freight rates for the two States, based on a prewar level, were about equal. The reductions of 10 per cent on rates from California in 1923 and of about 3 per cent on rates from Florida in 1928 caused the index numbers to now be separated by about 9 points in favor of California, which difference is deemed sufficient to cause readjustments and to render citrus production in Florida relatively less profitable.

Fruits and vegetables, H. C. Hensley (*Fed. Farm Bd. Bul. 1 (1930), pp. 28*).—Suggestions are made as a guide in so organizing local cooperative marketing associations to handle fruits and vegetables that such organizations may be eligible to affiliation with regional or national agencies formed for marketing these products. Forms of articles of incorporation, by-laws, marketing and organization agreements, minutes of meetings, etc., the text of the Capper-Volstead Act, and a list of cooperative marketing publications are included.

Marketing stock hogs in Missouri, P. RICHARDS and F. L. THOMSEN (*Missouri Sta. Research Bul. 146 (1930), pp. 70, figs. 24*).—This bulletin is based chiefly on data obtained from U. S. Department of Agriculture publications, from the records of the State veterinarian of the Missouri State Board of Agriculture, and from the replies to questionnaires made by 286 farmers in the hog-feeding area of Missouri and by 124 farmers in the stock hog producing section of the State. The shipments of stock hogs annually and by months from the more important central markets to Missouri and other Corn Belt States, the country shipments within Missouri and from Missouri to other States and from other States to Missouri, the death losses in the stock hog movement, stock hog prices and their seasonal variations, their relation to fat hog prices, and the relation of local and central market prices, price discrimination, etc., are discussed.

The total central market movement of stock hogs per year was found to vary roughly between 500,000 and 900,000 hogs. Iowa, Illinois, and Missouri are the chief buying States, the shipments into Missouri varying from 30,000 to 60,000 hogs per year. The shipments from country points to Missouri averaged about the same as the shipments from central markets. South Missouri has always been the most important origin of such shipments. South Missouri also ships a large number of stock hogs to other States, but usually such shipments do not exceed the number of hogs shipped to Missouri points. Both central market and country shipments to Missouri are made largely from January to April, inclusive. In Iowa and Illinois there is a considerable seasonal movement in the fall as well as in the spring. The average mortality for both central market and country shipments was found usually to vary between 4 and 5 per cent.

Prices of stock hogs were found to follow slaughter hog prices very closely, a correlation of the prices on the Kansas City market for 1920–1928 giving a coefficient of 0.93 ± 0.09. Stock hog prices were usually highest at times of greatest stock hog shipments, showing the total supply of hogs to be a much more influential factor than supplies of stock hogs alone. The margin of current fat hog prices over current stock hog prices was found usually to vary from 30 cts. to $1 per 100 lbs. Normally with a feeding period of three or four months the buyer of stock hogs can expect the greatest margin between cost and selling price when the hogs are bought in the late spring or late fall, and the lowest margin when they are bought in the summer.

The possibilities of improvements in the marketing of stock hogs through the producing and marketing of higher grade hogs, through reducing the cost of handling between producer and feeder, and by widening the market for such hogs from south central Missouri are discussed.

American cheese factories in Wisconsin, H. H. BAKKEN (*Wisconsin Sta. Research Bul. 100 (1930), pp. 30, figs. 8*).—This survey, made in cooperation with the U. S. Department of Agriculture, is based upon figures from 182 factories in the 12 counties of the 3 principal cheese-producing sections of the State. Cheese makers, officers, and patrons of cheese factories were interviewed, and records covering the years 1925–1927 and comprising 3,972 monthly reports and 331 annual statements of the factories were obtained.

Tables are presented and discussed showing the number of patrons per plant, value of buildings and equipment, volume of milk received, distance milk was hauled, type of ownership and management, efficiency and expenses of manufacturing, methods of paying and wages paid cheese makers, factors affecting the yield of cheese, types of sales agreements between factories and cheese buyers, and other factors bearing on the operation of cheese factories.

Of the 182 plants surveyed, 70 per cent had from 15 to 35 patrons, nearly 8 per cent less than 15, 13 per cent from 35 to 45, and 9 per cent more than 45

patrons. During the 3 years about 50 per cent of the factories received from 1,000,000 to 2,000,000 lbs. of milk per year, 30 per cent between 2,000,000 and 3,000,000 lbs., only 10 per cent more than 3,000,000 lbs., and about 5 per cent less than 500,000 lbs. Of the farmers supplying milk, 48.5 per cent lived less than 1 mile from the factory. The estimated value of factory buildings was less than $4,000 for 72 per cent, and that of equipment less than $2,000 for 73.5 per cent of the factories. Data from the monthly reports showed that the cheese yield per 100 lbs. of milk increased 0.2 lb. with each 0.1 per cent increase of butterfat content of milk, being 8.478 lbs. with 3 per cent milk and 11.877 lbs. with 4.6 per cent milk. The average yield of cheese per pound of butterfat ranged from 2.79 lbs. for 3.1 per cent milk to 2.606 lbs. for 4.2 per cent milk. Gross operating expenses in 1927 per pound of cheese decreased from 3.36 cts. for factories receiving less than 1,000,000 lbs. of milk to 2.2 cts. for factories receiving 5,000,000 lbs. or more.

Japan as a producer and importer of wheat, W. Y. Swen and C. L. Alsberg (*Wheat Studies, Food Research Inst. [Stanford Univ.], 6 (1930), No. 8, pp. [1]+351–378, figs. 6*).—This study was made with a view to ascertaining whether the steady upward trend in the international trade in wheat and flour in eastern Asia since the war is due to increasing density of population or changes in dietary habits. The statistics are discussed under the following headings: Area in rice and wheat in Japan proper, the volume of production of food grains, foreign trade in rice and wheat and wheat milling, forms of wheat consumption in the Orient, and the consumption of food grains in Japan.

[Reports on the grain trade of Canada, 1927, 1928, and 1929], W. Dougan and E. A. Ursell (*Canada Bur. Statis., Rpts. Grain Trade Canada, 1927, pp. 205, figs. 6; 1928, pp. 206, figs. 6; 1929, pp. 188, figs. 6*).—These reports continue the series previously noted (E. S. R., 59, p. 485).

Report of the Committee on Agricultural Co-operation in Scotland, M. Sprot et al. (*Edinburgh: Govt., 1930, pp. 45, fig. 1*).—This is the report presented to Parliament of the committee appointed October 10, 1929, to inquire into the present position of agricultural cooperation in Scotland and the steps practicable and desirable with a view to the development and extension of such cooperation. The growth and present status of cooperation, the possibilities of further development, and the factors that will assist such development are discussed, and recommendations are made for legislation, grants, etc.

American economic life and the means of its improvement, R. G. Tugwell, T. Munro, and R. E. Stryker (*New York: Harcourt, Brace & Co., 1930, 3. ed., pp. IX+737, pl. 1, figs. 437*).—This edition follows the general scheme of that previously noted (E. S. R., 55, p. 486). Some of the old material has been deleted, and several chapters of new matter have been added.

Book 1 (pp. 1–166), dealing with the present levels of living and how they came to be, covers the subjects of the present economic system and its origins, and the present levels of living—rural and urban poverty, comfort, and riches.

Book 2 (pp. 167–633), on raising the levels of living, deals with the raising of such levels (1) through efficient production, covering the meaning of production and its possible results, increasing farm production, increasing urban production by more effectively using physical science and human energy, directing industrial energy, business organization and ownership, technic of corporate production and of business, industrial coordination and control, and financial organization; (2) through the remaking of rural and urban life; (3) through the just apportionment of income, covering the problem of the just apportionment of income, what income is and how apportioned, individuals and groups in apportionment, and the aims and methods of reapportionment;

(4) through the reflective use of income, covering the need of reflection, how individual choices are made and ways of improving them, and group choices; (5) through the better management of government; and (6) through international cooperation.

Book 3 (pp. 635–728) discusses proposals for reorganization of the economic system, covering individualism, collective bargaining, the cooperative movement, government ownership, socialism, syndicalism, guild socialism, and the modification of schemes in experience.

Standards of living, E. L. Kirkpatrick (*Wis. Agr. Col. Ext. Circ. 241 (1930), pp. 79, figs. 16*).—This circular, which summarizes information regarding rural standards of living, was published in cooperation with the American Country Life Association for the 1930 Country Life Conference held at Madison, Wis., October 7–10, 1930.

Introduction to rural sociology, C. R. Hoffer (*New York: Richard R. Smith, 1930, pp. IX+418*).—This book is confined "to the sociological interpretation of facts pertaining to rural life that appear to have significance in all sections of the country," and is intended both for the general reader and as a textbook.

Part 1, the rural population and its characteristics, deals with the content of rural sociology, the rural population, its grouping, standard of living, health, recreational activities, occupational influences affecting it, and farm laborers and dependent and delinquent classes in it; part 2, rural social institutions, covers the rural family, church, and school, other educational agencies, and rural government; and part 3, rural social organization, deals with the types of organization, town and country and rural-urban relationships, international aspects of rural social organization, and the relation of rural social organization to rural progress, and discusses levels and methods in the study of rural life.

Selected references are included for each chapter.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

List of technical workers in the Department of Agriculture, and outline of Department functions, 1930 (*U. S. Dept. Agr., Misc. Pub. 93 (1930), pp. III+132*).—This is the usual list and outline (E. S. R., 62, p. 390).

Twenty-seventh general report of the Department of Agriculture and Technical Instruction for Ireland, 1928–29 (*[Irish Free State] Dept. Agr. and Tech. Instr. Gen. Rpt., 27 (1928–29), pp. V+198*).—This is a continuation of the series previously noted (E. S. R., 61, p. 691).

The smallness of America's rural high schools, W. H. Gaumnitz (*U. S. Dept. Int., Off. Ed. Bul. 13 (1930), pp. V+78*).—This bulletin presents and discusses statistical data regarding the number and size of rural high schools in the United States, the extent of the programs of secondary education undertaken, and how well children dependent on rural high schools are reached; summarizes the educational problems and limitations of the small high school; and cites ways and means that are being used in various communities to solve the problems.

County library service to rural schools, E. A. Lathrop (*U. S. Dept. Int., Off. Ed. Bul. 20 (1930), pp. V+53, figs. 4*).—This bulletin sets forth the results of a study made to discover the extent and character of the service extended rural schools by county libraries. The results are based largely on replies to a questionnaire from 144 county librarians in 32 States, supplemented by information from publications of county libraries and personal visits to such libraries in 5 States. Of the 144 libraries replying, 122 had 4,744 branches

and stations, and 109 of the 122 libraries had 2,898 branches and stations located in public school buildings.

Crop production: Principles and practices, H. D. HUGHES and E. R. HENSON (*New York: Macmillan Co., 1930, pp. X+816, pl. 1, figs. 162*).—This handbook brings together the results of investigations made during the last 50 years by the State experiment stations, the U. S. Department of Agriculture, and other research and educational agencies, and is prepared with a view to making them available for ready reference both to students and farmers. The intention of the authors is to present actual findings or data from which the student may make his own deductions and formulate his own conclusions. Each chapter is followed by study questions and application assignments.

FOODS—HUMAN NUTRITION

Report of the committee on the standard baking test, C. H. BAILEY ET AL. (*Cereal Chem., 7 (1930), No. 4, pp. 348–363, figs. 3*).—Incorporated in this annual report (E. S. R., 62, p. 488) are the following papers: Baking Characteristics of Various Types of Wheat as Reflected by Different Baking Procedures, by G. Moen (pp. 351–357); Hand Molding vs. Machine Molding, by C. C. Fifield and R. Weaver (pp. 358–362); and Report of Sub-Committee on Dough Thermometers, by R. C. Sherwood (pp. 362, 363).

Report of the committee on methods of testing cake and biscuit flours, M. M. BROOKE ET AL. (*Cereal Chem., 7 (1930), No. 4, pp. 364–379*).—This annual report contains recommendations of the committee and the following papers bearing upon the problem of testing soft wheat flour: Report of Subcommittee on Methods of Scoring, by R. A. Barackman (pp. 365–367); Effect of Temperature on the Dough and Its Influence on the Standard Baking Test, by V. E. Fisher (p. 367); Report on Methods of Incorporating Ingredients and Their Effect on Standard Baking Tests, by L. H. Bailey (pp. 368–371); Testing Soft Wheat Flours for Uses Other Than Cake Making, by J. A. Dunn (pp. 372, 373); Viscosity and the Experimental Cake, by E. E. Smith (p. 374); Mixing Time and Its Effect on Results of Standard Cake Baking Test, by G. L. Alexander (pp. 374, 375); The Water Tolerance of Soft Wheat Flours for Cake Baking, by C. B. Kress (pp. 376, 377); and Size and Shape of Pans and Their Effect Upon the Standard Baking Test, by C. B. McIntosh (pp. 377–379).

Some basic principles of photography as applied to cereal work, C. G. HARREL (*Cereal Chem., 7 (1930), No. 4, pp. 313–321, figs. 10*).—Factors considered most important in photographing cereal products are the angle of illumination and type of emulsion. The quality of the lens is considered of only minor importance.

Are you storing your Netted Gem potatoes for seed or family use? J. E. RICHARDSON and D. DOUGLASS (*Montana Sta. Rpt. 1929, pp. 81, 82*).—Netted Gem potatoes stored during the winter in a rather humid atmosphere at a low temperature (40° F.) and others of the same variety stored in a drier cellar at temperatures of from 53 to 60° were compared for appearance, cooking quality, and vitamin C content.

Potatoes from the first lot were crisp and firm, but showed the development in the white portion of a yellowish green color suggestive of solanin and those from the other lot were shriveled and sprouted. On cooking, those from the second lot were much more mealy than those from the first. In both raw and cooked form they also had a much higher content of vitamin C than those stored at the lower temperature.

It is noted that if potatoes are stored for the spring seed the first conditions for storage are better, but if they are to be used for cooking the warmer, drier cellar is to be preferred.

Practical fruit-canning, T. N. MORRIS and J. M. BRYAN (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt., 1929, pp. 94–97*).—Progress along three lines of research is reported as follows:

The brining of apples.—It is suggested that the prolonged soaking of apple slices in brine was advocated by Kohman (E. S. R., 49, p. 856) as a method of removing oxygen from the tissues before the close-pack methods were introduced, and that with such methods this is no longer necessary It has been shown that the quantity of air remaining in the tissues after correct steaming amounts to only about one-tenth of the original volume and is still further reduced by filling the cans and adding the sirup as hot as possible and by giving a very short exhaust. That the oxygen left in the cans when this method is employed has no appreciable effect on the rate of corrosion was shown in comparative experiments. Apple slices soaked in 2 per cent brine for 24 hours before canning, as often recommended, yielded a very insipid salt-tasting pack as compared with those which had been merely immersed in brine for a short period to prevent their turning brown. The use of a 50 per cent sugar sirup instead of water greatly improved the appearance and flavor of the pack.

Cold storage.—Strawberries and cherries frozen at —20° C., without sugar, both in open and closed vessels, and canned after 3 months' storage proved very inferior in flavor and appearance.

Storage of canned goods at 1° is recommended as a means of preserving the natural color of the product. This was demonstrated in a comparison of canned strawberries stored at 25°, at room temperature, and at 1°. After 3 months there was very little difference in flavor among the three lots, but those stored at 25° were very pale, at room temperature more brown than red, and at 1° a fine red color.

Addition of acid in canning fruits of low acidity to check the formation of hydrogen swells.—The addition of a small amount of citric acid, from 0.3 to 0.5 per cent, to the sirup in which fruits of low acidity, such as prunes and black and white cherries, are canned was found to check the formation of hydrogen swells in lacquered cans, as well as to improve the flavor and appearance of the cherries.

The use of raisins and other grape products in candy and ice cream, M. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 10 (1930), No. 1, pp. 5–8, figs. 3*).—Suggested uses, with recipes on a commercial scale, are given for grapes and raisins in the manufacture of candy, water ices, and ice creams.

The effect of acid potassium tartrate as an ingredient in angel cake, E. GREWE and A. M. CHILD (*Cereal Chem., 7 (1930), No. 3, pp. 245–250, figs. 2*).—Angel cakes were made according to a standard procedure and formula with the amount of acid potassium tartrate as the only variable and tested for H-ion concentration with the quinhydrone electrode and for color by the Munsell method as adapted by Nickerson (E. S. R., 62, p. 503).

The amounts of the tartrate varied by 0.4 gm. from 0 to 1.2 gm., each change representing an increase in acidity equivalent to about 0.4 pH units. With each increase in acidity the cake became more nearly white and of much finer grain. The effect upon color was slight in terms of hue, but marked in terms of brilliance and chroma.

To determine whether the changes in color and grain were due to changes in H-ion concentration or some other factor, three series of cakes were baked. In the first a comparison was made of the effect of acid potassium tartrate and sodium potassium tartrate. The cake baked with sodium potassium tartrate

was of no better color than the control baked without added tartrate. This indicated that the favorable effect was not due to the tartrate radical. Cakes were next baked with citric, malic, and tartaric acids in amounts equivalent in H-ion concentration to the acid potassium tartrate. The cakes baked with these additions were similar in color to the ones baked with acid potassium tartrate, indicating that the effect of the latter was due chiefly to its H-ion concentration. The use of eggs of varying H-ion concentration as the result of storage was likewise found to change the color and grain of the cakes in proportion to the acidity of the eggs.

Effects of the ingestion of tartrate or sodium aluminum sulfate baking powders upon growth, reproduction, and kidney structure in the rat, J. F. LYMAN and E. SCOTT (*Amer. Jour. Hyg., 12 (1930), No. 1, pp. 271–282*).—The ingestion by white rats of sodium aluminum sulfate-calcium acid phosphate baking powder residue in varying amounts up to about 2 per cent of the diet had no appreciable effect on the rate of growth, maximum adult size, longevity, reproduction, and nonprotein nitrogen of the blood. Similar experiments with tartrate baking powder residues up to 4 per cent of the diet likewise showed no appreciable injurious effect.

The effects of the habitual use of tartrate and aluminum baking powders upon the utilization of food in the rat, R. M. KRAFT (*Amer. Jour. Hyg., 12 (1930), No. 1, pp. 283–287*).—Supplementing the studies noted above, rats which had subsisted for 15 months on the experimental diets containing both types of baking powder and others on the usual stock diet were used for metabolism experiments to determine the coefficients of digestibility of the various diets. Variations in the average results for each group were not as great as the variations among the three animals in each group. The weights of the air-dried feces did not vary appreciably in the three groups, thus showing no cathartic action of the baking powder residues.

Magnesium and life; magnesium in fertilizers and foods [trans. title], M. JAVILLIER (*Bul. Soc. Chim. Biol., 12 (1930), No. 6, pp. 709–740*).—This critical review and discussion of the literature on the significance of magnesium in animal and plant nutrition contains numerous references to the literature and a number of tables showing the distribution of magnesium in plant and animal materials.

A study of the composition of human milk in the later periods of lactation and a comparison with that of early milk, S. T. WIDDOWS, M. F. LOWENFELD, M. BOND, and E. I. TAYLOR (*Biochem. Jour., 24 (1930), No. 2, pp. 327–342*).—This is an extension of an earlier investigation (E. S. R., 57, p. 391), which included only colostrum and early milk. While the same general plan was followed, it was not possible to deal with individual women over the whole course of the observations. In all, 51 women were studied, representing all stages of lactation from the first to the tenth month. The data obtained, combined with the findings of the earlier study, indicate the following general trends in the composition of human milk:

The percentages of calcium and phosphorus followed parallel curves throughout the course of lactation, although the variations in phosphorus were less than in calcium. The percentages of both rose to a maximum at the end of the second month and then slowly declined to the end of the tenth month.

The percentage of total ash was highest during the first two weeks, and then fell continually throughout the rest of the lactation period, the steepest fall occurring during the last month. The percentages of both calcium oxide and phosphorus pentoxide in the ash increased, the former from 15.5 per cent in the early weeks to 26.1 in the later months and the latter from 12.56 to 21.12. Slight variations in the ratio of the percentage of calcium oxide to phosphorus

pentoxide were noted, the averages rising from 1.35 to 1.42 and then falling to 1.25 during the last months.

The percentage of protein decreased rapidly from a high value immediately after parturition to the end of the first month, and then more gradually until it reached an average of about 0.9337 by the end of the tenth month. The percentage of sugar was lowest in the early milk, and after the first month varied little throughout the lactation period except in the case of a pathological condition of the breast when the amount of sugar was lowered.

Commercially prepared infant foods, G. J. and A. M. Hucker (*New York State Sta. Bul. 584 (1930), pp. 13, figs. 5*).—This publication, which is based on Technical Bulletins 153 and 154 (E. S. R., 62, p. 392), describes in nontechnical language the various types of commercially prepared infant foods on the market and discusses the standards which such foods should meet. The types of foods considered are reconstructed infant foods, generally made up of powdered milk, cod-liver oil, sugar, and salts; milk modifiers, such as lactose or sugar; protein milk, composed generally of dried milk to which casein has been added before drying; and lactic acid milk, which is cow's milk to which has been added chemically pure lactic acid or a culture to develop the acid in the milk itself. Powdered, evaporated, and condensed milks are also considered on account of their growing use for infant feeding.

The hot-lunch problem, G. V. Gray (*Home Econ. News, 1 (1930), No. 7, p. 78, figs. 2*).—Suggestions, based upon experience in a rural school in Cook County, Ill., are given for the necessary equipment and procedure for providing one hot dish for the school lunch. Sample recipes are included for potato soup and baked beans in amounts required for 25 servings.

Dietary habits of junior high school girls, L. M. Johnson and M. S. Chaney (*West. Hosp. Rev., 16 (1930), No. 2, pp. 55–58, figs. 4*).—A qualitative study of the dietary habits of 54 girls from 12 to 16 years of age in a Kansas junior high school is reported, with the conclusion that the diets of this group of girls were low in fruits, vegetables, and milk, that whole grain cereal products were not often consumed, and that meat was included in liberal amounts. The diets were thought to furnish an insufficient supply of minerals and vitamins and probably of protein on account of the small amount of cheese, eggs, and legumes. The calorie consumption was also considered low in most cases. The need for health instruction among high school students is emphasized.

A nutritional study of the white school children in five representative counties of Florida, C. F. Ahmann, O. D. Abbott, and G. Westover (*Florida Sta. Bul. 216 (1930), pp. 50, figs. 11*).—In this complete report of an investigation, the most important findings of which have been noted previously (E. S. R., 63, p. 692), a useful description is given of the standards and methods employed in the physical examination of the children and in the evaluation of the diets.

In analyzing the dietary records, the following score card was used, each value being based on the daily use of an average quantity of the specific food: Milk 20, butter 5, leafy vegetables 15, potatoes 5, other vegetables 10, raw fruit or sugarcane 15, cooked fruit 5, whole grain bread 10, cereal 5, and meat or eggs 10. For faulty dietary habits such as promiscuous eating between meals, unsuitable desserts, and improper arrangement of meals a deduction of 10 from this score was provided. The dietary records, which were obtained from the children for 2 or 3 days each, were grouped after scoring as extremely deficient, scoring 5 to 15; inadequate, 20 to 35; questionable, 40 to 55; adequate, 60 to 80; and commendable, 85 to 100. Of the 2,110 records

thus scored, 1.4, 28.5, 45.7, 23.4, and 1.1 per cent, respectively, fell in these groups. Milk had occurred in only 28.4 per cent, leafy vegetables in 27, and fruit in 20.9 per cent of the menus.

More than 45 per cent of the children had carious teeth, abnormal tonsils, and hookworm infestation and more than 30 per cent enlarged lymph glands, conjunctivitis, abnormal weight relations, and anemia. Heart defects were found in slightly more than 12 per cent of the children, a much higher figure than reported in tabulations by the U. S. Public Health Service. The incidence of heart defects was more common among the anemic children, those with defective tonsils, and with hookworm infestation.

A special study of the relation of the diet to the condition of the teeth was made on 406 children in one county. Of these, 186 used milk and 220 did not. Of the former, only 10 per cent had teeth which were not defective and of the latter 53.8 per cent. An examination of the diets of 514 anemic children showed that 3.5 per cent were extremely deficient, 40.2 inadequate, 39.1 questionable, and only 17 per cent adequate.

As noted in the preliminary report, no relationship could be established between the dietary scores and height and weight records. Hookworm infestation, abnormal tonsils, and thyroid disturbances influenced weight. That hookworm contributes to overweight rather than underweight was shown by the fact that 71.6 per cent of the overweight children and only 38.1 per cent of the underweight were infested with hookworm. Of the children with defective tonsils, 58 per cent were underweight, while only 13 per cent of the children free from tonsil defects were underweight. Of the comparatively few children with thyroid disturbance, 73 per cent were underweight.

The authors emphasize in conclusion that hookworm infestation and defective tonsils are defects which should be corrected, and that until such corrections are made weight alone should not be used as the standard for nutrition.

The diet of school children in relation to their health, M. E. FRAYSER and A. M. MOSER (*South Carolina Sta. Bul. 268 (1930), pp. 64, figs. 10*).—This study, similar in its purpose to the previously reported investigation dealing with preschool children (E. S. R., 62, p. 289), deals with the food and health habits and nutritional status of 322 rural white children 8, 9, and 10 years of age in 10 districts of one county of the State.

The survey consisted (1) of visits to the school to determine from the children themselves food likes and dislikes and the food eaten at lunch in the school building, (2) visits to the homes, where the mothers were questioned concerning past and present food habits of the children, and (3) medical and dental examinations by a physician and dentist specializing in children's work. Attempts were made in the home questioning to determine the economic status, housing, hygiene conditions, and available home food supply of the families concerned.

In most cases the children ate four meals on school days—breakfast, a box lunch at school, remnants from the family dinner on the return home from school, and supper. The percentage frequencies of the various items of food appearing most commonly in the four separate meals and in the total for the day are reported in charts. In analyzing the diet records, a slightly different score from that of the previous study was used. The present score, adapted from that of Davies (E. S. R., 59, p. 790), is as follows: Milk 1 qt. daily 24, potatoes (white or sweet) once a day 7, vegetables other than potatoes twice a day 10, extra allowance for vegetables if leafy vegetables are included 4 times a week 6, cooked fruits once a day 5, raw fruits or vegetables or canned tomatoes twice a day 14, meat once a day 8, eggs 4 times a week 12, and whole

grain cereals or bread twice a day 14. Approximately one-third of the diets rated above 70 according to this score, one-third between 60 and 70, and one-third below 60. The food group which appeared to be most inadequate was fruit. Adequate though not optimum amounts of meat and eggs and of vegetables were included in over half and milk and whole grain cereals in about two-fifths of the diets. The diets were thought to be for the most part inadequate quantitatively.

In the physical examinations, 41 per cent of the children were ranked as being in poor or very poor nutritional condition, 36 in fair, and 22 in good condition. The general condition of the teeth was considered good in 48 per cent, fair in 31, and bad in 21 per cent. Only 44 per cent of the children showed no evidence of decay in the 6-year molars.

A comparison of the diet scores with the various grades of nutrition, as determined by the physical examinations, showed that as the diets approached more nearly optimum standards the chances for satisfactory nutritional status were increased, although there was no definite positive correlation. Weight for height and age was found to be unreliable as the sole method of detecting malnutrition. Some relationship was evident between high economic status of the family and satisfactory nutrition and between academic standing in the school and satisfactory nutrition. No positive relationship between dental trouble and nutritional status could be established. Several reasons for this are given. In conclusion the authors state that "the study suggests that the present rural school schedules and student transportation systems are not always conducive to the best health of the children."

A report on seasonal variation in the growth of school children, J. B. Orr and M. L. Clark (*Lancet* [*London*], *1930, II, No. 7, pp. 365–367, figs. 2*).—Evidence was obtained during the investigation on the effect of milk on the growth of school children in several cities in Scotland, as reported by Orr (E. S. R., 60, p. 192) and Leighton and Clark (E. S. R., 61, p. 587), of an uneven distribution in increases in height and weight during the year. In order to obtain further information on the apparent seasonal variations in growth, the periodic measurements were continued on the same children for another year and the data for the three years grouped by seasons and ages. In all 657 children aged from 7 to 11 years were weighed in quarterly periods.

The data show by far the greatest increase in height in the quarter ended June 30 and the smallest increase in that ended December 31. The weight increases on the other hand were greatest in the quarter ended September 30, followed by the quarter ended December 31. In the quarter ended June 30 about 25 per cent of the boys actually lost weight, though increasing in height.

The paper includes a brief review of the literature on seasonal variations in growth.

A dietary survey of six hundred and seven families in seven cities and towns in Scotland, J. B. Orr and M. L. Clark (*Lancet* [*London*], *1930, II, No. 11, pp. 594–598*).—In connection with the investigation noted above, a dietary survey was made in the homes of many of the children by means of records of the food consumed for a week. In all, 700 records were obtained, of which 607 were considered sufficiently accurate for analysis. This paper reports briefly the statistical analyses of the diets, with a discussion of the significance of the data. The Cathcart standards of food requirements for different ages were used throughout, and in addition the records obtained from one town were calculated by the higher Hawley scale.

The average daily values obtained were 3,609 calories, 107.8 gm. protein, 574.4 gm. carbohydrate, and 98.1 gm. fat per man value. The average content

of significant ash constituents was calcium 0.86, phosphorus 1.7, and iron 0.0143 gm. Of the entire number of families, 41.7 per cent fell below the general accepted standards of the protein requirement for adults, 13.8 per cent of the fat, 24.5 per cent of the calcium, 23 per cent of the phosphorus, and 61.6 per cent of the iron requirement. In 37 diets analyzed by the Hawley scale, which takes into account requirements in protein and minerals for growth in children, the average per man values were protein 74.77, calcium 0.53, phosphorus 1.101, and iron 0.0087 gm. In only one case was the protein standard considered necessary for optimum growth reached and in nine cases for calcium, two for phosphorus, and none for iron.

It is concluded that the diets on the whole were adequate as regards energy value, but low in protein and still lower in minerals. It is pointed out that these findings are in harmony with the results obtained in supplementing the diets of the children with milk as noted previously. The fact that skim milk gave as good results as whole milk pointed to the probability that the caloric intake of the children was sufficient, and that the need was for additional protein and minerals.

Some aspects of the chemistry of nutrition in relation to health, H. C. Sherman (*Porto Rico Jour. Pub. Health and Trop. Med., 5 (1930), No. 4, pp. 407–432*).—This paper is based on a series of four lectures given at the School of Tropical Medicine in San Juan, Porto Rico, in February, 1930. Particular attention is given to the nutritional problems now urgent in Porto Rico. It is thought that the abundance of fruits and root vegetables in Porto Rico provides a sufficiency of vitamin C, sunshine of vitamin D, and beans and rice of vitamin B, but that calcium, vitamin A, and possibly vitamin G present nutritional problems of very real practical importance to health. It is urged that efforts be made in Porto Rico to encourage the more general consumption of green foods and to introduce into cultivation the particular green foods acceptable to the Porto Rican taste. A wider use of canned and dried milk is also recommended.

***The influence of certain dietary supplements on the nutrition of the* African native, I, F. C. Kelly and J. McA. Henderson** (*Jour. Hyg., 29 (1930), No. 4, pp. 418–428, figs. 3*).—The investigation reported in this and the two following papers forms a part of a joint investigation by the Rowett Research Institute, Aberdeen, Scotland, and the Kenya Medical Service, British East Africa, on deficiency diseases in native Africans.

This paper reports a series of calcium metabolism studies conducted on 42 male native Africans serving long-time sentences in Nairobi Prison, Kenya Colony. The men, selected to be as uniform as possible in tribe, physique, and occupation, were divided into five groups, one of 14 and the others of 7 each. All of the groups were kept on the regular prison diet for 6 weeks and were then put on the experimental diet, which consisted of the prison diet with no additions for the control group and with the following additions for the other groups: One hundred twenty-five cc. of a soluble mineral mixture plus 15 cc. of cod-liver oil, 15 cc. cod-liver oil, 125 cc. soluble mineral mixture, and 15 cc. olive oil plus 0.001 gm. iodine as potassium iodide solution, respectively. The soluble mineral mixture was designed to be of approximately the same composition as the ash of cow's milk and in the amount given daily was equivalent to the ash of 1 pint of milk. At the end of 11 weeks the supplements were withdrawn and the observations carried on for a post period of 5 weeks. The observations consisted of weight measurements three times during the preperiod and weekly thereafter; total blood calcium in the preperiod, toward the end of the supplement period, and in the last week of the

post period; and calcium balances for four representative men from each group over the last 4 weeks of the supplement period, one from each group being determined each week.

Improvements in weight took place in the groups receiving the mineral supplement and the cod-liver oil alone and combined and to a less degree in the group receiving olive oil and iodine. The blood calcium was at low level in all of the subjects, averaging 9.2 mg. per 100 cc. of serum. Toward the end of the supplement period there was a rise in blood calcium in 50 per cent of the basal and olive-oil groups and a more marked rise in all the other subjects with one exception. The most marked increase was in the cod-liver oil group.

While it is admitted that it is doubtful if much importance can be attached to the results of the balance experiments on account of their short duration and the small number of subjects, it is noted that the groups which had no calcium additions were in negative or only slightly positive calcium balance, while in the groups receiving the mineral mixture, either alone or with cod-liver oil, the subjects in general showed a definite positive balance, which was higher on the cod-liver oil plus mineral group than on the mineral group alone.

The influence of certain dietary supplements in relation to the calcium requirements of growing African natives, II, J. McA. Henderson and F. C. Kelly (*Jour. Hyg.*, *29* (*1930*), *No. 4*, *pp. 429–438*, *figs. 2*).—In order to obtain more data on the effect upon calcium balance of such additions as were made in the study noted above, 5 young native African prisoners averaging 16 years of age were used as subjects of a metabolism experiment divided into four periods as follows:

(1) A preliminary period of 3 weeks when the subjects were on the usual prison diet; (2) a period of 5 weeks on the prison hospital diet, differing very slightly from the prison diet; (3) a period of 9 weeks on the hospital diet, with various supplements; and (4) a post period of 7 weeks on the hospital diet unsupplemented, except in the case of the control who had received no supplement previously but now received cod-liver oil and the mineral mixture. The various supplements were 15 cc. of cod-liver oil, the same mineral mixture as in the first experiment, 15 cc. of cod-liver oil plus the mineral mixture, and 1 pint of cow's milk, respectively. The calcium balances were determined twice in the first period, 3 times in the second, and 4 times in the supplement period. The subjects were weighed weekly throughout the whole time and serum calcium determinations made twice.

Of the 5 subjects, 4 had negative calcium balances on the regular prison diet (furnishing 0.32 gm. of calcium per person per day) and 1 was in calcium equilibrium. The negative balances were not appreciably reduced by cod-liver oil alone, but became positive when the diet was supplemented by the mineral mixture alone or with cod-liver oil and by milk. From the findings it was calculated that 0.43 gm. of calcium daily was the maintenance requirement of the subjects, and that with the excess calcium in the mineral mixture as much as 50 per cent and in the milk over 70 per cent was retained.

It is emphasized in the discussion that when the calcium intake is low, the most valuable addition that can be made is primarily one of calcium itself.

The best growth curves were those of the subjects receiving cod-liver oil or milk. After the supplements had been withdrawn, the best growth was in the subject who had been receiving cod-liver oil. It is thought that this may have been due to the growth-stimulating influence and possible storage of vitamin A. A comparison of the calcium balances and the growth curves showed that growth took place in the absence of adequate calcium storage.

A note of the influence of the addition of certain supplements to the diets of African natives, III, J. McA. Henderson and F. C. Kelly (*Jour. Hyg., 29 (1930), No. 4, pp. 439–442, fig. 1*).—In the first part of this paper data are reported and discussed on the weight changes in two groups of 21 prisoners, all selected from the subjects of the two studies noted above. The basal diet for both groups was the ordinary prison diet. One group received this alone for 10 weeks and the other the same diet with the addition of the mineral mixture and cod-liver oil as in the first study. At the end of this period the supplements were transferred to the control group and the experiment continued for another 6 weeks.

The subjects on the basal diet alone showed definite increases in weight which are attributed chiefly to more careful supervision than under prison routine. The group receiving the supplement, however, gained considerably more in weight. When the conditions were reversed, the group which had been controls either maintained the higher weight level which they had reached in the first period or showed a small but definite increase, while the weight curves of the other group showed a decided falling off.

The second part of the paper summarizes the balance experiments of the first two studies and discusses them with reference to the findings of Sherman and MacLeod (E. S. R., 54, p. 593), which became available only after the completion of the second paper.

A striking agreement was brought out in the results obtained in the two investigations, one based upon the calcium content of rats' bodies and the other upon calcium balance experiments on human subjects.

The fluctuations of the capillary blood sugar in normal young women during a twenty-four hour period, M J. Dionne and J. J. Abenstam (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 393–397*).—This study with women subjects (hospital nurses or physicians) was conducted in the same manner as the previous study with men (E. S. R., 61, p. 893), hourly samples of blood being taken throughout the 24 hours, even when the subjects were asleep.

As in the previous study, each subject maintained a very constant concentration level of capillary blood sugar while at rest in bed. The average level for the entire group was 94 mg. per cent, and the majority of the individual subjects had values close to this. Since the data collected for young women were in close agreement with those previously reported for young men, "it seems justifiable to conclude that when the Folin micro procedure is used for measuring the sugar content of the whole blood and the subject is in a basal condition the normal fasting values should lie within or very close to the range 90 to 100. It is emphasized that the basal range for blood sugar values probably extends over a smaller area than has been the generally accepted conception."

The effect of cereal extracts on blood-calcium, L. Mirvish (*Biochem. Jour., 24 (1930), No. 2, pp. 233–238*).—Essentially noted from a preliminary report (E. S. R., 62, p. 594).

Clinical calorimetry, XLV, XLVI (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 651–680, fig. 1*).—These two papers deal with observations made in the ward, calorimeter, and laboratories of the Russell Sage Institute of Pathology on the subjects of the investigation of the effects of prolonged meat diets. Other phases of this investigation have been noted previously from papers by Lieb and Tolstoi (E. S. R., 61, p. 589; 62, p. 491).

XLV. *Prolonged meat diets, with a study of kidney function and ketosis,* W. S. McClellan and E. F. Du Bois (pp. 651–668).—The discussion in this paper includes the nature of the diet and its effect on the clinical condition of the subjects, on the urinary constituents, on the kidneys, and on fat metabolism.

Two subjects lived on an exclusive meat diet for over a year and a third for 10 days. The relative amounts of lean and fat meat were left to choice, with the result that the protein content varied from 100 to 140 gm. daily, fat from 200 to 300 gm., carbohydrate from 7 to 12 gm., and fuel value from 2,000 to 3,100 calories per day. During the first week all three men lost weight, after which their weights remained constant. The initial loss in weight is attributed to shifts in the water content while the body was adjusting itself to the low carbohydrate diet.

Of the two subjects who continued on the diet, the blood pressure of one remained constant, while in the other the systolic pressure decreased 20 mm. and the diastolic remained uniform.

Aside from one instance when the proportion of protein exceeded 40 per cent, with resulting diarrhea, the control of the bowels was not disturbed. The total acidity of the urine was increased from two to three times that of the acidity on mixed diets and acetonuria was present. The fatty acid: glucose ratios of the foods consumed were between 1.9 and 3, and from 0.4 to 7.2 gm. of acetone bodies were excreted. Urine examinations, determinations of the nitrogenous constituents of the blood, and the kidney function tests revealed no evidence of kidney damage. There was no evidence of vitamin deficiency, and at the end of the year the subjects were mentally alert and physically active and showed no specific physical changes in any system of the body.

XLVI. *Prolonged meat diets, with a study of the metabolism of nitrogen, calcium, and phosphorus*, W. S. McClellan, V. R. Rupp, and V. Toscani (pp. 669-680).—This paper contains the analyses for nitrogen, fat, calcium, and phosphorus of the meat and meat products used in the investigation, and data on the percentages of ingested nitrogen and fat excreted in the feces and on the nitrogen, calcium, and phosphorus balances of the two subjects who continued on the diet for over a year.

The losses of nitrogen in the feces were 4.5 and 7.5 per cent of the intake and of fat 3 and 9.2 per cent, respectively, these figures in comparison with results from the same subjects on a mixed diet showing normal utilization. One of the subjects remained in nitrogen equilibrium on an average nitrogen intake of 19.9 gm. daily and the other a slight negative balance on an intake of 18.7 gm. The average daily intake of calcium was from 0.05 to 0.15 gm. and the daily excretions 0.44 and 0.47 gm., respectively, both subjects showing decided negative balances. In spite of the high phosphorus intake one of the subjects had a positive balance of as low as 2.34 gm. and the other a negative balance of —5.34 gm. This was due to increased excretion in the urine only.

Diet and tissue growth.—VII, Response to high protein diets and unilateral nephrectomy during reproduction and lactation in the rat, with particular reference to kidney changes in both mother and offspring, H. T. Parsons, A. H. Smith, T. S. Moise, and L. B. Mendel (*Arch. Path., 10 (1930), No. 1, pp. 1–22, figs. 4*).—This is the complete report of an investigation which has been noted essentially from a preliminary report (E. S. R., 59, p. 892.) In addition to the conclusions noted previously, it is emphasized that lactation and gestation have a greater influence than gestation alone on the degree of enlargement of the remaining kidney in rats fed a high casein diet following unilateral nephrectomy, and that the kidneys of the young born of mothers on the high casein ration weigh more in proportion to body weight at weaning than those of the young born from mothers given rations comparatively low in protein. The high casein rations (86 and 76 per cent) were less satisfactory for successful lactation than those containing less casein (20 per cent), but the same allowance of vitamin-rich foods.

The comparative value of different food proteins for reproduction and lactation in the rat.—I, Beef muscle, liver, and kidney, M. M. CLAYTON (*Jour. Nutrition, 2 (1930), No. 5, pp. 491–507*).—In this study, in which the author had the assistance of M. J. Cummings, beef round, liver, and kidney, both cooked and raw, were fed to rats in order to determine their relative efficiency as sources of protein and vitamins for reproduction and lactation.

In studying the effect of alterations in the proportions of protein and fat, changes were made in the amount of lard fed. It was found that the rations in which lard was omitted entirely were better for reproduction than those which contained even a small amount. Cod-liver oil was also found to have a detrimental effect when mixed with large quantities of the ration. When the effects of variations in vitamin E were ruled out by supplying this vitamin in adequate amounts, the kidney protein ranked first, followed by the liver protein and then the muscle protein. When differences in the quality of the proteins were largely ruled out by feeding them at a level of 20 per cent, the vitamin E content of the dried meats was found to decrease in the order of round, liver, and kidney. Evidence was also obtained of an insufficiency of vitamin B, particularly in the round and kidney.

"It is thus difficult to say which of the three meats is best for reproduction and lactation unless it is specified in what form and amount the food is to be fed, and with what supplements. If fed in the dried form at a 20 per cent protein level in a ration containing no substances which would have a destructive effect on vitamin E, beef round probably requires supplements of minerals and vitamins A, B, and D. Beef liver and kidney probably require in addition a supplement of vitamin E. In the raw state beef round is not easily assimilated by rats, but liver and kidney appear to have a higher food value when raw than when cooked."

Effects of thirst, starvation, and vitamin B deficiency on the weight of internal organs, P. P. T. SAH and T. W. LI (*Chinese Jour. Physiol., 4 (1930), No. 2, pp. 255–258*).—Observations are reported on the weights of various organs of two series of groups of albino rats, one weighing about 40 and the other about 70 gm. each. The former consisted of normal rats of that weight and of others reduced in weight from about 70 to 40 gm. by starvation, by thirst, and by deficiency in vitamin B, respectively. The 70-gm. series included normal rats of that weight and others that had been kept at that weight by moderate deficiency of vitamin B.

The weights of the various organs in thirst and acute vitamin B deficiency were very similar and distinctly different from those of the starvation group. In both thirst and vitamin B deficiency the liver was reduced to about half that in normal rats of the same initial body weight, but not to as great an extent as in the starved animals. The spleen in both groups was reduced to about one-fourth the size in normal rats of the same initial body weight and one-half that of normal rats of the same body weight, while the spleen in starvation was about twice this size. There was atrophy of the kidneys in starvation but not in thirst or vitamin B deficiency. There was about the same degree of atrophy of the heart and lungs in all three types of inanition and no significant change in weight of the brain and adrenals.

Vitamin content of marine plankton, J. C. DRUMMOND and E. R. GUNTHER (*Nature [London], 126 (1930), No. 3176, p. 398*).—In a brief note the authors summarize the results obtained in the examination for vitamins A and D of samples of phytoplankton (diatoms) and zooplankton collected in the same locality in the spring and summer of 1928. The tests were conducted on the dried material extracted with petroleum ether and under conditions precluding overheating and oxidation. The vitamin A tests included growth tests on

rats, the antimony trichloride color reaction, and determinations of absorption spectra; and the vitamin D, the line and X-ray tests. Since the extracts of both materials were highly colored, unsaponifiable fractions were used for the color tests.

The phytoplankton extracts gave positive results for vitamin A in 20-mg. doses in the feeding tests and a strong blue color with antimony trichloride, while the zooplankton extracts gave negative results in both these tests and no absorption band at 310 to 330$\mu\mu$. In the vitamin D tests the phytoplankton gave doubtfully positive results (much less than 100 Coward antirachitic units per cubic centimeter in 0.02 cc. doses) in the line test and negative results in X-ray tests in 50 mg. doses. The zooplankton gave slightly better results in the line test and negative results in 20 mg. doses in the X-ray tests.

On the vitamin content of kippered herrings, S. and S. Schmidt-Nielsen (*K. Norske Vidensk. Selsk. Forhandl., 1 (1926–1928), No. 15, pp. 45–47, figs. 4*).—Kippered herrings are said to contain vitamins A and D in such amounts as to warrant their use in place of cod-liver oil "for children and others who can not stand the latter, and then not as medicine but instead of meat and the like for one of the three chief meals a day."

A method of purification of carotin and the vitamin activity of a purified carotin [trans. title], M. Javillier and L. Emerique (*Compt. Rend. Acad. Sci. [Paris], 191 (1930), No. 4, pp. 226–229*).—The authors have subjected carotin obtained from carrots to rigorous purification in the absence of air, and have tested the highly purified crystals for vitamin A activity with positive results. The method of purification is essentially as follows:

Crystallized carotin is dissolved in carbon disulfide and the solution poured drop by drop into a large excess of boiling methyl alcohol, the carbon disulfide removed, and the liquid in which the precipitated carotin remains in suspension filtered while still boiling in an atmosphere of nitrogen. The process can be repeated as many times as desired.

After five successive purifications in this manner of 650 mg. of crystallized carotin melting at 172 to 173° C. and active for rats depleted of vitamin A in daily doses of 0.03 mg., there remained 178 mg. of the purified carotin melting at 184 to 185°. When fed in 0.06 mg. daily amounts to 100 mg. rats depleted of vitamin A, this highly purified carotin checked loss in weight, cured xerophthalmia, and brought about almost normal growth. Almost as good results were obtained with 0.045 mg. daily, while with doses as low as 0.03 mg. loss of weight was checked and xerophthalmia cured, but growth was irregular.

It is noted that the carotin thus purified is of quite as high a purity as that of Euler and Karrer, and has the same melting point as that reported by Dulière, Morton, and Drummond (E. S. R., 63, p. 8) for the highly purified carotin which they found inactive.

On the physiological rôle of carotin and allied substances, K. Kawakami and R. Kimm (*Inst. Phys. and Chem. Research [Tokyo] Sci. Papers, 13 (1930), No. 246, pp. 231–243, figs. 13*).—Carotin prepared from carrots and repeatedly recrystallized from carbon bisulfide and ethyl alcohol had a constant melting point at 167 to 169° C. and gave various color reactions characteristic of the vitamin A concentrate biosterol. When administered in olive oil solution as the sole source of vitamin A to young rats depleted of their A reserves, the minimal dose for the cure of xerophthalmia and restoration of growth was from 0.02 to 0.05 mg., or about the same amount as required of biosterol. Similar results were obtained for carotin prepared from capsicum, but other carotinoids and related substances such as lycopin, α- and γ-crocetin, diphenyl-

dodecahexaene, difurylоctatetraene, and a carotinoid-like substance derived from squalene were all inactive.

Attempts to isolate carotin from biosterol were unsuccessful. It is thought that the most striking difference between the two is in their absorption spectra, carotin having two absorption bands at 470 to 490$\mu\mu$ and 440 to 460$\mu\mu$, but lacking the band at 320 to 330$\mu\mu$ characteristic of biosterol.

Recent findings concerning vitamin A (fat-soluble growth factor) [trans. title], B. and H. von Euler (*Klin. Wchnschr., 9 (1930), No. 20, pp. 916–918, figs. 3*).—This literature review deals chiefly with reports from the authors' laboratory (E. S. R., 61, p. 793) and elsewhere concerning the relationship between carotin and vitamin A.

Puberty an error in the assay of vitamin A [trans. title], S. and S. Schmidt-Nielsen (*K. Norske Vidensk. Selsk. Forhandl., 2 (1929), No. 15, pp. 51–54, fig. 1; Eng. abs., p. 54*).—Essentially noted from another source (E. S. R., 63, p. 92).

Dietary requirements for fertility and lactation.—XXI, Further studies of the rôle of wheat oil in lactation, B. Sure (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 2, pp. 148–150*).—This continuation of the series of papers noted previously (E. S. R., 61, p. 92) consists of a brief report on the value for lactation in rats of wheat oil as a supplement to a diet of whole wheat 66.7, skimmed milk powder 32, and sodium chloride 1.3 per cent, with from 0.1 to 0.3 cc. daily of cod-liver oil. The optimum results in lactation were secured with a daily supplement of 0.3 cc. of cod-liver oil, but on a smaller dosage, 0.1 cc., the addition of small amounts of wheat oil or butterfat gave better lactation results than with the cod-liver oil supplement alone. It is thought that the wheat oil acted partly as a protective mechanism against vitamin A oxidation and partly as a vitamin A supplement, but not through furnishing a special vitamin for lactation.

Dietary requirements for fertility and lactation.—XXII, Further studies of the rôle of milk fat in fertility and lactation, B. Sure (*Jour. Nutrition, 2 (1930), No. 5, pp. 485–489*).—In continuation of the above-noted investigation, rats were fed through five generations on the two-thirds whole wheat-one-third skim milk powder diet supplemented with increasing amounts of butterfat (5, 7, and 9 per cent of the diet) and also on a similar diet with whole milk powder in place of the skim milk powder.

The fertility and lactation records showed that as the butterfat increased there was an increase in the number of young successfully weaned. The diet containing whole milk powder instead of skim milk powder was not as efficient as the skim milk powder supplemented by 9 per cent butterfat and containing only about 0.4 per cent more fat than the whole milk powder diet. It is suggested that changes may have taken place in the whole milk powder during storage.

None of the milk powder diets could be considered optimum for lactation. The chief limiting factor is thought to be vitamin B. Although the whole milk powder diet is considered unsuitable for raising a vigorous rat colony, the diet supplemented with fresh vegetables is thought to be satisfactory for studies on vitamins A and D, since the storage of these vitamins on this diet is slight.

The influence of vitamin A deficiency on the oestrous cycle of the rat, II, K. H. Coward, B. G. E. Morgan, and F. J. Dyer (*Jour. Physiol., 69 (1930), No. 3, pp. 349–362, figs. 3*).—A repetition of the senior author's work on the influence of vitamin A deficiency on the oestrous cycles of the rat (E. S. R., 61, p. 794), using the improved basal ration later developed (E. S. R., 62, p. 690),

is reported, with results confirming the earlier conclusion that continuous occurrence of cornified cells in the vagina can not be relied upon as a criterion of vitamin A deficiency.

Vitamin A in disease (*Jour. Amer. Med. Assoc., 95 (1930), No. 11, pp. 798, 799*).—This editorial review questions the clinical results of Mellanby and Green (E. S. R., 62, p. 294), on the ground that the high mortality rate which they reported for the cases of puerperal septicemia not receiving vitamin A treatment indicated that in a large proportion of this group the intense fulminating type of septicemia was involved, while Mellanby admitted that the cases in which vitamin A concentrates were used were not of the fulminating type and consequently might be expected to have a low mortality rate. It is suggested, however, that on account of the promising results obtained by Green and Mellanby in their animal work (E. S. R., 60, p. 791) vitamin A should be given very extensive clinical tests.

The Jansen and Donath procedure for the isolation of antineuritic vitamin, R. R. Williams, R. E. Waterman, and S. Gurin (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 559–579, figs. 3*).—Essentially noted from another source (E. S. R., 63, p. 292).

Glucose tolerance in avitaminosis due to low antineuritic vitamin B, S. Lepkovsky, C. Wood, and H. M. Evans (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 239–250, figs. 6*).—The literature on the relation of vitamin B to carbohydrate metabolism is reviewed briefly, and a series of studies is reported in which this question was approached through glucose tolerance tests conducted on carefully paired rats on diets alike except that one included yeast known to be of poor quality with respect to vitamin B and the other the same amount of a yeast known to be potent in B. In comparing the results attention was paid to the possibility of a greater concentration of blood in the animals suffering from vitamin B deficieny than in the controls. Determinations of the specific gravity of the blood of both groups showed gradual decreases, but no appreciable differences between the animals low in vitamin B and the controls.

In the animals suffering from only slight deficiency in vitamin B, the glucose tolerance curves did not vary greatly from the controls, but in others in advanced stages of beriberi there was evidence of definite interference in carbohydrate metabolism. The lowest tolerance was exhibited by rats showing typical signs of beriberi. During the cure of this condition the glucose tolerance increased until a stage was reached where there was no longer any marked interference with the tolerance.

The Williams-Waterman vitamin B_3, W. H. Eddy, S. Gurin, and J. Keresztesy (*Jour. Biol. Chem., 87 (1930), No. 3, pp. 729–740, figs. 5*).—Some of the findings in this continuation of the study of the distribution and properties of the Williams-Waterman pigeon factor vitamin B_3 (E. S. R., 60, p. 293) have been noted from another source (E. S. R., 63, p. 292).

The method employed for testing for vitamin B_3 is to maintain adult pigeons on polished rice until well advanced toward polyneuritis and then add an amount of vitamin B_1 sufficient to prevent the polyneuritis. The various sources of vitamin B_1 employed were Williams and Waterman Y concentrate (E. S. R., 60, p. 293), the Kinnersley-Peters antineuritic concentrate (E. S. R., 60, p. 94), and the Jansen-Donath crystalline preparation (E. S. R., 57, p. 489). After from 10 to 14 days, measured amounts of the food to be tested are added and the relative richness in vitamin B_3 determined by the extent of weight increase.

A photograph is included, showing a remarkable contrast in the growth of chicks when supplied with both vitamins B_1 and B_3 and when deprived of B_3 but adequately supplied with B_1.

Recent work on vitamin D, I, II (*Nature* [*London*], *126* (*1930*), *Nos. 3168, pp. 115, 116; 3171, pp. 222, 223*).—The first part of this review deals with the biological assay, and the second with the chemistry of vitamin D.

The antirachitic vitamin D (*Lancet* [*London*], *1930, II, No. 9, pp. 503, 504; also in Brit. Med. Jour., No. 3634* (*1930*), *pp. 331, 332*).—The Medical Research Council of Great Britain announces the preparation under the direction of the council's committee on accessory food factors of a solution of irradiated ergosterol which is recommended for adoption as standard for comparative estimations of vitamin D. The solution, which was prepared under reproducible conditions and has been subjected to tests for stability for over two years, is available for general distribution to properly qualified laboratories. In recommending this standard solution, the committee adopted the following resolutions:

"(a) That the standard solution of irradiated ergosterol prepared and maintained by the National Institute for Medical Research be recommended for adoption as a standard for the comparative estimation of vitamin D.

"(b) That the unit of vitamin D be defined as the antirachitic potency of a quantity of this preparation corresponding to 0.0001 mg. of the ergosterol used in its production.

"(c) That either the X-ray method, the 'line test,' or chemical analysis of the bones of the experimental animals be recommended for use in the estimation of vitamin D.

"(d) That supplies of the standard material be made available for general distribution from the National Institute for Medical Research, Hampstead. As the supply is limited it is hoped that users will themselves prepare standard solutions of irradiated ergosterol for use in individual tests, retaining the National Institute's material for reference. It is important that all such standard materials be kept at temperatures not exceeding 0° C."

A lack of D-vitamin in the liver oil of the rabbit-fish (Chimaera monstrosa], [I], II, S. and S. SCHMIDT-NIELSEN (*K. Norske Vidensk. Selsk. Forhandl., 2* (*1929*), *Nos. 14, pp. 48–50; 36, pp. 128–130*).—In the first of these two papers the authors report that the liver oil of the rabbit fish, which belongs to the gristly fishes (Elasmobranchii), subclass 2, Holocephali, is very low in its content of vitamin D as determined by the method of Poulsson and Lövenskiold (E. S. R., 59, p. 293). As a possible explanation of these findings in comparison with the high content of vitamin D in most fish liver oils, the authors suggest that this class of fish in contrast to the bone fishes does not need vitamin D to catalyze the metabolism of calcium. Since the liver contains some vitamin A, the possibility is suggested of a selective absorption of A and not D from the plankton which constitutes the chief food of the fish.

In the second paper vitamin D tests were conducted with rabbit fish liver oil obtained by ether extraction as well as by melting as in the first study. The extracted oil showed stronger antirachitic properties than the melted oil, but the content of vitamin D was still very low.

The content of antirachitic vitamin in cartilaginous fish [trans. title], S. and S. SCHMIDT-NIELSEN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 189* (*1930*), *No. 5–6, pp. 229–238*).—The authors have extended the investigations noted above to several species, with results confirming their earlier conclusion in regard to the liver oil of the basking shark that the livers of cartilaginous fish are much lower in vitamin D than the livers of bony fish such as cod. No proportionality could be demonstrated between the content of vitamins A and D.

Contribution to the study of the biological activity of the sterols.—Study of the sterols of plankton [trans. title], G. BELLOC, R. FABRE, and H. SIMONNET (*Compt. Rend. Acad. Sci.* [*Paris*], *191* (*1930*), *No. 3, pp. 160–162*).—Two

samples of plankton collected from the same water, one in the middle of the summer and the other in the spring, were examined for the presence of *ergosterol and vitamin D*. The sterols were separated by saponifying the chloro*form extract with potassium hydroxide and crystallizing the unsaponifiable matter from ethyl alcohol, the whole process being conducted rapidly, with protection from air and light. The crystallized products were subjected to physical (ultra-violet absorption), chemical (Rosenheim color reaction for ergosterol (E. S. R., 61, p. 416)), and biological analyses. The summer plankton gave positive tests for vitamin D by all three methods, while the spring plankton showed the presence of ergosterol but not of vitamin D.*

It is concluded that the biological activity of plankton is a function of numerous factors, prominent among which is light. The presence of the antirachitic factor in the food of fish is thought not to exclude the hypothesis of activating properties of certain organs or the intervention of light radiations.

The toxicity for laboratory animals of large doses of irradiated ergosterol [trans. title], H. SIMONNET and G. TANRET (*Bul. Soc. Chim. Biol., 12 (1930), No. 3, pp. 371–394*).—Essentially noted from other sources (E. S. R., 63, p. 594).

Some effects of the administration of excessive doses of irradiated ergosterol to normal and to parathyroidectomized dogs, N. B. TAYLOR, H. D. BRANION, and H. D. KAY (*Jour. Physiol., 69 (1930), No. 4, pp. XXXV–XXXVII*).—*The authors note in abstract various experiments furnishing evidence that vitamin D exerts its effect upon calcium metabolism through stimulation of the parathyroid function, as suggested in previous reports by Hess, Weinstock, and Rivkin (E. S. R., 63, p. 297) and Morgan and Garrison (E. S. R., 63, p. 396). The evidence is along three lines as follows:*

(1) In dogs which had developed violent tetany following thyro-parathyroidectomy a dosage of 1 cc. of irradiated ergosterol having 10,000 times the potency of cod-liver oil, when given by mouth, restored the animals to normal within an hour. (2) In normal dogs given 0.14 cc. per kilogram of the same preparation of irradiated ergosterol by mouth twice daily death occurred in from 60 to 64 hours, with symptoms of hypercalcemia and post-mortem findings identical with the effects of parathyroid overdosage, as reported by Collip, *Clark, and Scott (E. S. R., 53, p. 564) and by Macleod and Taylor (E. S. R., 55, p. 886). (3) Dogs from which the parathyroids had been removed showed a decided resistance to overdosage of irradiated ergosterol and there was no calcification of the arterial walls.*

A comparative study of liquid and dry milk as anemia-producing diets, G. C. SUPPLEE, O. D. DOW, G. E. FLANIGAN, and O. J. KAHLENBERG (*Jour. Nutrition, 2 (1930), No. 5, pp. 451–469, figs. 15*).—In this comparison of liquid and dried milk as anemia-producing diets, rats were placed at 30 days of age in carefully lacquered individual cages and fed the milk in question for periods up to 14 weeks, during which time weights, blood counts, and hemoglobin determinations with the Dare hemometer were taken weekly. The various milks, both liquid and dry, were obtained in parallel daily from a commercial milk drying plant, thus avoiding any differences in composition other than those caused by drying. In some instances the milk was supplemented by additional milk ash. All of the samples were analyzed for iron and copper, the xanthate method being used for the latter determination.

Anemia was produced in the animals fed exclusively on natural liquid milk, on milk boiled for two minutes, and on reconstituted spray process milk powder containing normal amounts of iron and copper. Reconstituted dried milk obtained by the roller process, having the same content of copper as the liquid milk from which it was prepared but an increased iron content resulting from

contact of the milk with the drying cylinders, prevented the development of anemia and also corrected to an appreciable degree the anemic condition resulting from prolonged feeding on natural liquid milk. In cases where the iron content of the reconstituted milk was approximately twice that of fluid milk, the blood count and hemoglobin did not reach the levels attained on the normal stock ration, but in one group fed reconstituted milk with an iron content approximately four times that of normal milk, normal hemoglobin and blood count levels were maintained. Liquid milk supplemented with the ash of liquid milk or dried milk did not furnish as much protection against anemia as did unsupplemented reconstituted milk.

"The results are not conclusive in showing that the copper content of the milk is always the vital factor concerned in the anemia of white rats receiving milk diets exclusively. The increased quantity of iron in the desiccated milk, and such other changes in its chemical structure as may concurrently result from the desiccating operation, appear to impart measurable antianemic properties to this type of milk."

Pernicious anaemia, L. S. P. Davidson and G. L. Gulland (*St. Louis: C. V. Mosby Co., 1930, pp. XII+293, pls. 22, figs. 8*).—This monograph is based on the extensive literature dealing with the disease and on the authors' experimental and clinical experience. Of particular interest is the discussion of the liver treatment and an appendix by R. Pybus on dietotherapy, with special reference to the treatment of pernicious anemia.

Some newer remedies in the treatment of pernicious anemia: Desiccated stomach, R. Isaacs and C. C. Sturgis (*Jour. Amer. Med. Assoc., 95 (1930), No. 8, pp. 585–587, figs. 3*).—Further experience in the use of desiccated defatted hog stomach in the treatment of pernicious anemia has shown it to be even more effective than noted in the first report (E. S. R., 62, p. 398). It has been found possible to induce remission with 15 gm. daily of the dried material and to maintain it with 7 gm. daily. The clinical dosage recommended, however, is 10 gm. for each million red blood cell deficit in the red blood cell count and the maintenance dose 10 gm. from five to seven times a week.

It is stated that "the absence of the peculiar liver taste, as well as the possibilities for the production at a lower cost than liver extract, are factors in its favor."

Treatment of secondary anemia, H. Z. Giffin and C. H. Watkins (*Jour. Amer. Med. Assoc., 95 (1930), No. 8, pp. 587–592*).—This paper includes a concise summary of recent literature on experimental and clinical observations concerning the treatment of secondary anemias. Among the newer materials found effective in certain types of secondary anemia is desiccated fetal calves' liver.

The occurrence of a pellagrous-like syndrome in chicks, L. C. Norris and A. T. Ringrose (*Science, 71 (1930), No. 1851, p. 643*).—A brief description is given of the internal and external manifestations of a pellagrous-like condition in chicks fed a normal diet with the exception that Merck's powdered egg albumin was substituted for the more common protein of animal origin. The substitution of purified casein for the egg albumin in the basal ration delayed the onset of the pellagrous-like symptoms, but brought about no improvement in growth. The addition of 2.5 per cent of autoclaved yeast improved growth, prevented granulation of the eyelids and incrustation of the corners of the mouth, but brought about no improvement in the scaly cracked condition of the feet. Five per cent of autoclaved yeast completely prevented all of these conditions and gave still better growth, while with 10 per cent autoclaved yeast added to the basal diet growth was more than one-third greater than the average growth for White Leghorn chicks under ordinary conditions.

"*The data obtained in this experiment demonstrate the intense requirement of another species for the vitamin or vitamins present in autoclaved yeast, commonly called vitamin B_2, vitamin G, or the P-P factor, and indicate that the chick may be a more suitable animal than the white rat for determining the quantity of this vitamin present in foodstuffs.*"

Calcium shifts in experimental rickets, J. MOBELLE (*Jour. Physiol., 70 (1930), No. 1, pp. XIII, XIV, figs. 4*).—Radiographic and histological observations during the course of healing of experimental rickets are reported briefly. These support the view that "the calcium which must be secured is at least partially provided, firstly, by the immediate neighborhood, secondly, by the spongious trabeculae which constitutes a reservoir of readily available calcium."

The energy requirements of intense mental effort, F. G. and C. G. BENEDICT (*Natl. Acad. Sci. Proc., 16 (1930), No. 6, pp. 438–443*).—Studies are reported on the effect of sustained mental effort on the respiratory metabolism and heart rate of six subjects, five men and one woman. The mental effort consisted in three or four 15-minute periods devoted to solving, without writing or talking aloud, certain problems of multiplication of two figures by two other figures. The conclusion drawn is that "with intense sustained mental effort, such as in multiplication, there is a noticeable increase in the heart rate, a rather considerable change in the character of the respiratory movements, an increase in the volume of air passing through the lungs, a small increase in the carbon dioxide production, a smaller increase in the oxygen consumption, and consequently a slight increase in the apparent respiratory quotient. The increase in oxygen consumption, which may be taken as the best index of energy transformations, is such as to suggest that the increase in heat production as a result of intense mental effort of this type can hardly be of the order of more than 3 or 4 per cent. In view of the sense of extreme, almost overpowering fatigue in both mind and body following sustained mental effort, it is surprising that mental effort has such an insignificant effect upon the general metabolism or level of vital activity."

The significance of surface area determinations, H. H. MITCHELL (*Jour. Nutrition, 2 (1930), No. 5, pp. 437–442*).—Surface area determinations of chickens and rats placed in different positions are reported. These show considerable differences depending upon the position, leading the author to conclude that "direct measurements of the surface area of animals placed in some definite position, although they may be closely reproducible and readily conformable to mathematical description, do not possess the definite interpretation ordinarily given them. For example, there is neither a rational nor an empirical basis for assuming that the basal metabolism of an animal is more closely related to the surface area determined from a certain convenient position of the animal than to the surface area relating to any other position that the animal may naturally assume. And the possible differences between the surface areas of the same animal in different natural positions are not inconsiderable. These considerations mean that the heat produced by an animal per square meter of body surface possesses no absolute meaning, but that it may still be a highly useful measurement for comparative purposes if the surface measurement for different animals is made by exactly the same method."

TEXTILES AND CLOTHING

The relation between the economic status of the Oklahoma farm family and the farm woman's standards of management with respect to clothing, G. FERNANDES (*Oklahoma Sta. Bul. 197 (1930), pp. 16*).—This bulletin covers the phases relative to the purchase and home manufacture of clothing of the extensive survey noted in part in previous bulletins (E. S. R., 58, p. 788; 59, p.

487; 60, p. 488). The schedule used for determining these practices was based on that used by O'Brien and Campbell in their survey of trends in home sewing (E. S. R., 58, p. 299). Approximately 100 schedules were taken in each of five counties in the State. The distance to the shopping center for ready-made goods averaged 11.2 miles for the whole group, although 26 per cent of the entire number of families lived at a distance of 15 miles or more from the shopping center.

Approximately two-thirds of the 514 women who reported on the subject of buying clothing from mail-order houses stated that they patronized them to some extent. The farm-owner families used mail-order houses somewhat more than tenants. The reason given by some of the women for buying from mail-order houses was that they were not overpersuaded by sales people to buy what they did not want. Of those patronizing mail-order houses, 67 per cent bought yard goods, 63 ready-made clothing, and 50 per cent shoes. The numbers of women making certain garments for women and children were compared with similar data from the more extensive survey by O'Brien and Campbell. House dresses, summer wash dresses, aprons, slips, and nightgowns were made by nearly the same percentages of farm women in the two groups. The Oklahoma women made more clothing for children and fewer silk and wool dresses, coats, and hats for women than did the farm or village women of the other study.

Of the women who did sewing to any appreciable extent, 89 per cent unhesitatingly gave lower cost as the outstanding reason for home sewing. The chief reason given for buying ready-made clothing was the saving of time and energy. Other reasons given were a desire for better styles and technical difficulties in home sewing, particularly fitting.

But few differences were noted throughout the entire study between the habits of the owner and tenant classes, presumably representing considerable differences in income. It is suggested, however, in conclusion that perhaps the range of income of the families interviewed was too narrow to show differences in standards of management.

HOME MANAGEMENT AND EQUIPMENT

What size of pressure cooker shall I buy? J. E. Richardson and D. Douglass (*Montana Sta. Rpt. 1929, p. 81*).—Recent tests conducted with pressure cookers of various sizes have shown that the smaller the cooker the longer the time required for any given material. For general convenience and efficiency a 17- or 18-qt. cooker is recommended.

MISCELLANEOUS

Fortieth Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut, for the year ending June 30, 1928 (*Connecticut Storrs Sta. Rpt. 1928, pp. [4]+549, figs. 83*).—This consists of Bulletins 150–161, all of which have been previously noted.

[Forty-first Annual Report of the Michigan Station, 1928] (*Michigan Sta. Rpt. 1928, pp. 147–221, fig. 1*).—This contains reports of the heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue. Analyses of vinegar are also included (p. 169).

Solving farm problems: Thirty-sixth Annual Report of the [Montana Station, 1929], F. B. Linfield et al. (*Montana Sta. Rpt. 1929, pp. 95, figs. 42*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1929, a report of the director and heads of departments on the work of the station, and meteorological data. The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

NOTES

Florida Station.—An $18,000 refrigeration plant has been installed at the station and is now in operation under the direction of the horticulturist. This plant contains six storage rooms and two rooms for freezing, has modern equipment, and is automatically controlled. Studies on preserving Satsumas and avocados have been begun and will be extended to oranges, grapefruit, papayas, fruit juices, pulps, and other materials.

Iowa College and Station.—C. C. Culbertson has been appointed chief of beef cattle, swine, and sheep production. Byron H. Thomas has been appointed professor of animal husbandry in the college and chief in animal chemistry and nutrition in the station.

Maine University.—According to a note in *New England Homestead*, Arthur L. Deering, assistant director of extension, has been appointed extension director beginning January 1 vice Dr. L. S. Merrill, who will continue as dean of the College of Agriculture.

Ohio State University.—A home management house of 18 rooms and basement is under construction at a cost of about $30,000. This will be divided into 2 homes of Colonial and Tudor style, respectively, each of which will accommodate 6 students, a chaperone, and perhaps a child for practice courses of 6 weeks' duration.

Rhode Island College and Station.—Raymond G. Bressler, deputy secretary of agriculture of Pennsylvania and formerly vice dean of the Pennsylvania College and head of its department of agricultural economics, has been appointed president beginning April 1. Donald R. Willard has been appointed assistant chemist in the station beginning January 1, vice Harry S. Hall, resigned.

Utah College and Station.—Dr. R. J. Evans, a former director of the extension division, has been appointed head of the agronomy department vice Dr. George Stewart, resigned to accept an appointment with the U. S. D. A. Forest Service. E. J. Maynard, associate in animal investigations at the Colorado Station, has been appointed head of the department of animal and poultry husbandry vice Dean K. C. Ikeler, resigned to become general manager of the Ogden Livestock Yards.

Virginia Truck Station.—Dr. Harry G. Walker of the Crop Protection Institute, Columbus, Ohio, has been appointed entomologist beginning February 15.

Wisconsin University.—A contract has been let for a new agronomy wing to the horticultural building to cost about $130,000.

Pan Pacific Agricultural Conference.—Plans are being completed for a Pan Pacific agricultural conference to be held in Honolulu next August. This will be an outgrowth and continuation of the first Pan Pacific Food Conservation Conference of 1924. Its chief object is expected to be the formation of a permanent Pan Pacific agricultural association to include food products of land and sea.

Among the topics outlined for discussion are the wastage of tropical soils, the world rice situation and its future, agricultural research, the future of the plantation system, the division of labor between countries in regard to agricultural production, the economic region and its characteristics, sugar, the population problem in the Pacific, and plant and animal pests. A miniature agricultural fair is also under consideration in connection with the conference.

EXPERIMENT STATION RECORD

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EDITORIAL

THE SURVEY OF THE LAND-GRANT COLLEGES AND UNIVERSITIES

The recent report of the U. S. Office of Education on the survey of land-grant colleges and universities is doubtless the most impressive and the most important publication relating to the activities of these institutions which has thus far appeared. It consists of two volumes of approximately 1,000 pages each, and embodies information derived from not far from 500,000 pages of questionnaire returns and in other ways. It deals with an inquiry extending over three years at an expenditure of about $117,000. Obviously it represents one of the most elaborate and comprehensive investigations of collegiate education which has ever been undertaken.

The initiative for this unique enterprise was taken by the land-grant institutions themselves through the Association of Land-Grant Colleges and Universities. In 1926 the executive committee of this association extended a formal invitation to what was then the Federal Bureau of Education to conduct a survey of their activities, since, it was stated, "the time has come when the colleges themselves feel that there should be a national study of these agencies, with a view to determine how well they are fulfilling the purposes for which they were established and what changes or modifications, if any, are necessary in order to enable them to meet more effectively the new situations that are arising." Following the provision by Congress of the necessary funds, this survey was entered upon by the bureau "as a national study of the accomplishments, the present status, and the future objectives of the land-grant type of education."

Under the policy adopted, the bureau assumed entire control of the work and responsibility for the report, but early determined that "the study should be a cooperative one and that the funds available should be utilized primarily to direct, coordinate, and release the efforts of individual institutions and cooperating organizations." A National Advisory Committee of ten members was set up with the Secretary of the Interior as Chairman and the Secretary of

Agriculture, the heads of the Association of Land-Grant Colleges and Universities and the Conference of Negro Land-Grant College Presidents, the State superintendent of public instruction of Illinois, and five representatives of the institutions themselves, and this committee functioned in an advisory capacity throughout the survey. Additional advisory committees on subject matter and functional fields, organized from the land-grant college personnel on recommendation of the national technical groups concerned, had much to do with the planning of the inquiry into their respective lines of work and the reviewing of tentative reports of the results obtained therein. In addition 43 of the institutions designated local committees of cooperation, and the survey staff itself of 85 members was recruited largely by supplementing the bureau's own personnel, headed by Dr. Arthur J. Klein, chief of the division of higher education, by the temporary detail of numerous college presidents, extension, experiment station, home economics, and engineering directors, deans, librarians, accountants, and other specialists from a wide range of the institutions. There was also cooperation with such organizations as the American Veterinary Medical Association, the Association of Governing Boards of State Universities and Allied Institutions, the American Vocational Association, the American Home Economics Association, the Federal Board for Vocational Education, and the U. S. Department of Agriculture.

Since it was impossible with the funds available to set up field staffs in the various lines of inquiry and carry on the study by having each such group visit all the land-grant institutions, recourse was had to the questionnaire method, but this was elaborately safeguarded and supplemented. A voluminous questionnaire seeking information on a total of 19 fields of activity was carefully prepared and submitted to each institution, and eventually 92 per cent of these questionnaires were returned and utilized. The extent of the cooperation in this respect ranged from as low as 76 per cent for the questions dealing with the arts and sciences to 100 per cent for engineering and veterinary medicine. Large numbers of special questionnaires were also sent to selected groups of alumni and former students, from whom 37,342 returns were received, and to each member of the institutions' staffs, 12,032 of whom furnished records on many points of interest.

Tentative reports in the several fields were prepared from the assembled data by specialists brought to Washington for the purpose, submitted in turn to the appropriate advisory committee and the National Advisory Committee, and finally reviewed by the director of the survey and his staff. No attempt has been made in the report to accredit the authorship in any case to individuals, presumably because the final form in so many cases has been a

mosaic in which the contributions of many minds have been well-nigh inseparably intermingled.

The fundamental thought in carrying on the survey has been to present, not a collection of surveys of individual institutions, but a summary and discussion from the standpoint of functional lines of interest and activity that run through all or at least a large proportion of them. Following a preface and historical introduction, the subject is presented under 20 parts. These are entitled control and administrative organization, business management and finance, work of the registrar, alumni and former students, student relations and welfare, staff, the library, agriculture, engineering, home economics, arts and sciences, commerce and business, teacher training, military education, professional veterinary medicine, summer session, extension services, research, graduate work, and negro land-grant colleges. It is announced that provision has been made for the issuing of separates of each of these parts. As the edition of the complete report is not large, this plan should greatly facilitate the wide distribution of the material.

The value of the survey as thus conceived and conducted is twofold. It has assembled and made available a stupendous amount of data which will doubtless be used for reference purposes and as a basis for further studies for many years to come. In addition there has been attempted a constructive interpretation of these data from the point of view of the welfare of the Nation.

Both of these services should be very helpful. Despite the invaluable annual reports of the Commissioner of Education, the Office of Experiment Stations, the U. S. D. A. Extension Service, and numerous other agencies, much information regarding the work and status of the land-grant institutions has been obtainable only through a canvass of the 69 individual institutions here included, and in many cases it has not hitherto been available even to the institutions themselves. One of the specific accomplishments of the survey has been its bringing home to these institutions the need of gathering systematically statistical data on many matters for which little provision had previously been made. The survey will thus be of value not only for what it has already elicited but as a starting point for even more complete information in the future.

Partly because of the limitations of space, some of the data collected in the survey have not been summarized for the report, and in other instances what are given are not presented in sufficient detail for certain purposes. It is of interest to note that in some of these fields the Office of Education announces that much additional information can be obtained by students by consultation of the original questionnaires. Specific mention is made of such prom-

ising sources for sociological and related studies as the returns from alumni and former students and the members of the staff.

The statistical phase of the report has been effectively supplemented by the interpretative discussions which make up the bulk of its pages. In view of the method of preparation of these discussions and especially their wide range of authorship, it should not be surprising to find considerable variation in the treatment of different topics or that some subjects appear to have been more adequately handled than others. In some fields extensive generalization has not been easy or perhaps warranted and in these for the most part a conservative policy has been pursued. In others, the authors have not hesitated to make concrete recommendations, not infrequently couched in vigorous terms.

Many of these recommendations deal with matters outside the field of discussion in these columns. It is hoped, however, to give consideration to the section dealing with research in a later issue of the *Record*. The suggestion is also made that the sections on agriculture, home economics, teacher training, professional veterinary medicine, extension services, graduate work, business management and finance, control and administration, the staff, the library, and the negro land-grant colleges contain in especially full measure those phases of more immediate significance and appeal to those who are concerned with the progress of agriculture and home economics. Nor should it be overlooked that the entire report is of importance to all who are interested in what the survey deems the central and dominating ideal of the land-grant colleges and universities—the democratization of higher learning.

As an integral part of the survey, the original plans contemplated a supplementing of the comprehensive technical report now presented by a briefer and more popular discussion of the findings for the use of what is often vaguely termed the "general public." This discussion is still unwritten. Very likely its preparation would be even more difficult in some respects than the task already accomplished. Yet if adequately done it might serve an even more useful purpose by presenting within convenient limits a readily comprehensive picture of the land-grant institutions at work to-day. In the meantime an intensive study of the various sections of the report itself will reveal a host of details and yield many pertinent suggestions.

The 52 land-grant institutions admitting white students are collectively shown, for example, to have total incomes from all sources for the fiscal year 1928 of $142,182,108, an increase of 310 per cent since 1915. Despite the general impression that this enormous advance in receipts is due almost wholly to increased support from the States, actually but 47 per cent of the total gain was so derived, the

remainder coming from Federal funds, private gifts, student fees, endowment yields, and institutional earnings. Yet it is pointed out that "recent reorganizations of State governments, the creation of State budgets, and the extension of the power of State agencies over the finances and the internal affairs of the land-grant colleges have in many instances tended to supersede the authority of institutional governing boards and institutional administrative officers." Special mention is also made of the increased revenues obtained from the students themselves, who now supply nearly 11 per cent of the total income. "The initial conception of the land-grant institutions was that they should be free public agencies of higher education open to all youthful citizens of the State. That a compromise with this principle has long since been made is indicated by the multitude of fees levied by the different institutions."

What important educational agencies the land-grant institutions have become is indicated by the fact that while they constitute only one-half of one per cent of the colleges and universities of the United States, they are enrolling 16 per cent of its student population in higher learning. Their total number of resident students in 1927–28 was 153,494, of whom 11,347 were in agriculture, 29,530 in engineering, 15,268 in teacher training, 57,060 in arts and sciences, 7,753 in home economics, 11,539 in commerce and business, 633 in veterinary medicine, and 13,899 in other departments. As compared with 1920, considerable gains in enrollment have been recorded in all these fields except agriculture, where there is a decrease from 13,697 students, and a nominal decrease in veterinary medicine. Concerning this point the report has to say, "the number of students who enroll in agriculture varies with the condition of agricultural industry. This is true although emphasis upon the training of research and extension workers, high school teachers of agriculture and science, for State and Federal employment, and for business more or less closely related to agriculture tend to make this variation less acute than when the objective is primarily a back-to-the-farm one."

During the entire period from 1863 to 1928 it appears that the land-grant institutions have conferred a total of 403,531 degrees, of which 78.2, 10.6, 1.2, and 0.5 per cent, respectively, have been the bachelors', masters', doctors', and honorary degrees. Additional information regarding the careers of some of the more recent of these recipients was supplied in the questionnaires returned by over 20,000 of the graduates themselves. Much of the data is on an occupational basis, and a number of tables deal with earnings and salaries. According to one of these tables, salaries show a steady rise from the average of $1,802.11 for the 687 graduates 1 year out of college to $2,919.28 for the 5,995 5-year men, $4,630.26 for the 3,397 10-year men, and $8,375.97 for the 1,005 graduates 30 years out of college.

These data are of considerable significance because of the relatively large number of graduates reporting. An interesting though not wholly encouraging comparison may be made, for example, of these figures with the salary scales elsewhere reported for the staff members of the institutions themselves, these showing a median rate ranging from $2,005 for instructors to $4,278 for professors and $5,193 for deans.

Some of the most specific suggestions for improvement of institutional facilities are to be found in the section on libraries. So far as these very essential adjuncts to institutional work are concerned, they represent in the land-grant institutions "to a large extent a development of the twentieth century," and the opinion is frankly expressed that their importance is not yet everywhere fully recognized. The outstanding difficulty is insufficient financial support, and this is attributed in many cases to a lack of knowledge on the part of administrators as to what constitutes adequate library facilities and in others to a failure fully to appreciate the place of the library in the educational system. "In more than three-fourths of the land-grant institutions much increased financial support is needed. In the group of libraries with the least use and smallest support the library budget should be increased to about four times the present amount. Institutions which are allotting less than 4 per cent of their funds for library purposes or which are spending less than $20 per student should carefully examine the use made of their libraries, the adequacy of the book collections, and the efficiency of the personnel as compared with libraries with larger ratios of expenditures."

The section on agriculture naturally gives special consideration to the much debated question of objectives. On this point it concludes as follows: "Preparing students for general farming is no longer a primary function of the resident undergraduate work of colleges of agriculture in the land-grant institutions. Social, economic, and educational advances require that this fact be recognized frankly by the institutions and by their constituencies. The objectives of higher education in agriculture are increasingly and properly those of preparing, first, research workers in the scientific and social fields related to agricultural production and distribution and to rural life; second, extension workers for service in the dissemination of knowledge concerning the applications of scientific and economic truth to the problems of rural living; third, workers in all types of business and commercial activities related to agricultural production, distribution, and service; fourth, teachers of vocational agriculture and science in the public high schools; fifth, public servants in the investigating and regulatory depart-

ments of the State and National Governments; and sixth, overseers and managers of specialized and large-scale farm enterprises."

A similar situation is disclosed in home economics education, though it is predicted that this subject will make more rapid progress in defining its objectives and in creating a means for their attainment than has been the case with some of the other more recent fields of education. None the less, "the most obvious superficial situation revealed by study of home economics courses and curricula is confusion of objectives, confusion of means adapted to the attainment of objectives, and confusion of lines of demarcation between subject-matter fields. The impression is created that home economics is bewildered by the wealth of possibilities, by the necessity of selecting from the multitudinous materials available those best suited for its purposes, by the variety of demands, and by the chasms of ignorance that must be bridged."

The section on extension services enumerates many direct and substantial benefits which these agencies have brought to rural people, citing statistics as to the objective results of this work in terms of the participation of local groups in the adoption of practices designed to improve the business of farming. It is made clear, however, that "these are not the most significant measures of extension achievements. Far more valuable and permanent are the less tangible results of the development of attitudes of mind that express an eagerness to participate further in the process of continuing education. This outstanding record can not be readily measured and tabulated for any given period. Its significance is noticeable and appreciated, however, by a visit to any rural community where the service has been in operation any length of time. Every day witnesses more people not only becoming familiar with the fact of its existence, but finds them seeking ways of profiting by using various phases of its educational offerings. So long as educational ideals guide the operation and administration of the extension service and so long as those responsible for fulfilling its functions bear clearly in mind the true objective being sought, namely, the development of people, there will be no serious question raised as to its place in the educational system or as to the significance of its achievements."

The situation as regards teacher training is frankly discussed, and it is stated that "more carefully defined and more scientifically validated objectives for teacher preparation in the institutions should be established. . . . In view of the fact that from 25 to 75 per cent of the graduates of the colleges or divisions of arts and science, agriculture, home economics, industrial education, the graduate school, and other units of the land-grant institutions enter

teaching, financial support of teacher training should be more definitely and amply provided. Such data as are at hand indicate that the present financial support of teacher training is not adequate, and that it may well be extended in keeping with recent intensive and extensive development of the field of public education as a whole. . . . Courses in professional education are susceptible of great improvement. Such improvement should follow increasing research and experimentation."

Although graduate work has been offered for more than half a century in certain of the land-grant institutions, it is found that only within the past two decades have the enrollments been very large. At present there are wide variations, the ratio of graduate to undergraduate registrations ranging from 1:6 to 1:528. Four objectives are recognized. These are "the advancement of knowledge through research by staff and students, the training of students for research, the training of students for teaching, and the training of students for management in certain industrial or related fields." The outstanding problems are set forth as those of consistent and adequate support and standardization and coordination. "Such standardization as may be necessary for work leading to the master's or doctor's degree in land-grant fields may well be undertaken by special conferences of land-grant college administrators called together under the auspices of the Association of Land-Grant Colleges and Universities."

The foregoing references to a few of the topics taken up in the report should not be construed as an attempt at a complete review or even as an approximate estimate of its scope and content. To cover adequately a publication which deals with a host of themes so diverse as the improvement of undergraduate publications, the demand for veterinary education, the objectives in negro land-grant institutions, and the extent of agricultural advancement due to research, to cite a few at random, is a task far too extensive for the space limits of these columns. What is hoped is that some idea of the magnitude and importance of the undertaking has been afforded, and that interest will be aroused for many a careful and intimate study of this invaluable work of reference.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

An introduction to the chemistry of plant products.—Vol. II, Metabolic processes, P. Haas and T. G. Hill (*London and New York: Longmans, Green & Co., 1929, 2. ed., vol. 2, pp. VIII+220, figs. 12*).—A revision of volume 1 has already been noted (E. S. R., 60, p. 201). The second edition of volume 2 takes up the subjects of the living plant, the synthesis of carbohydrates, the synthesis of fats, the synthesis of proteins, respiration, and growth.

Histamine: Its pharmacology and its significance in humoral physiology, W. Feldberg and E. Schilf (*Histamin, Seine Pharmakologie und Bedeutung für die Humoralphysiologie. Berlin: Julius Springer, 1930, pp. XII+582, figs. 86*).—The following main topics are given, under many subheads: The chemistry, detection, and occurrence of histamine; general pharmacology; special pharmacology; and the reaction of the organism of histamine-like substances. An author index and comprehensive subject index conclude the volume.

Carotin and vitamin A [trans. title], L. K. Wolff, J. Overhoff, and M. van Eckelen (*Deut. Med. Wchnschr., 56 (1930), No. 34, pp. 1428, 1429*).—The authors have attempted to distinguish between carotin, xanthophyll, and vitamin A in various food materials by the following differences in properties:

(1) The antimony trichloride reaction gives a blue color with all three, but the color with vitamin A has an absorption band of 610$\mu\mu$ and the other two of 590$\mu\mu$. (2) In a mixture of the three, the intensity of the color reaction is considered to give some indication as to the presence or absence of vitamin A, since vitamin A is colorless, while carotin and xanthophyll are characterized by their yellow color. (3) On shaking a petroleum ether solution of xanthophyll and carotin with 90 per cent alcohol, xanthophyll is taken up by the alcohol and carotin remains in the petroleum ether. Under these conditions vitamin A is also taken up by the alcohol and can thus be distinguished from carotin. All of the materials tested were of known vitamin A activity. In egg yolk, carotin, xanthophyll, and vitamin A were detected; in butter, carotin and vitamin A; and in extracts of carrots, green cabbage, spinach, and portulaca only carotin was found, spectroscopic examination of the blue color with antimony trichloride showing only a band at 590$\mu\mu$.

These findings are thought to be in harmony with the well-known fact that all plant materials which are good sources of vitamin A are colored while certain colorless animal products are good sources of vitamin A, and with the observation of Steenbock and Boutwell (E. S. R., 43, p. 367) that in plants the vitamin A activity is associated with carotin and not with xanthophyll. The authors also report the synthesis of vitamin A in the livers of rabbits following the administration of carotin and the presence of both carotin and vitamin A in the livers of other rabbits after liver feeding.

Preparation of soil samples for pipette analysis, E. Winters, jr., and M. B. Harland (*Jour. Amer. Soc. Agron., 22 (1930), No. 9, pp. 771–780, figs. 3*).—"The diversity of opinion regarding the adequacy of deflocculating procedures and

the probability that a given procedure is not equally effective on all soils led to the studies reported in this paper," contributed from the Illinois Experiment Station. "The conclusions reached in the present work may be expressed in the following tentative outline of a procedure for dispersion: Treat 10 gm. of freshly air-dried soil with 200 cc. of N/10 HCl, stirring 1 hour; or let stand overnight. Wash thoroughly in a Buchner filter and transfer to a shaking bottle. Shake 48 hours with 0.11 per cent Na_2CO_3. The addition or substitution of a sampling interval equivalent to 1μ diameter is recommended."

The determination of the replaceable bases and the base-exchange capacity of soils, H. D. Chapman and W. P. Kelley (*Soil Sci., 30 (1930), No. 5, pp. 391–406*).—The purpose of the contribution from the California Experiment Station here noted is a "brief discussion of the methods for, and the errors involved in, the determination of replaceable bases in soils; to discuss the results of some special studies on methods for the determination of replaceable bases in soils containing alkaline earth carbonates; and to give the results of special studies on the determination of base-exchange capacity by the NH_3-absorption method." The data obtained are presented in support of the following conclusions:

"The determination of the replaceable bases of soils is not highly exact. The results are likely to be complicated by solubility and decomposition processes which take place between the solutions used and various constituents of the soil. Such constituents are probably most important in relatively immature soils of dry climates. The Hissink sodium chloride method, the alcoholic barium chloride method of Magistad and Burgess, and the method involving the use of alcoholic potassium chloride all give reasonably accurate results for the determination of replaceable calcium in calcareous soils, provided other soluble or decomposable calcium compounds are absent from the sample. . . .

"The base-exchange capacity of the soil can be determined by digesting and leaching the sample with normal ammonium acetate solution. This solution brings about approximately complete replacement of the H ions without the necessity of treating the sample with an excess of alkali. It was found that methyl alcohol is useful for the removal of the occluded electrolyte, but that it is necessary to employ as nearly neutral methyl alcohol as possible. If the methyl alcohol is acid, its H ions may replace more or less of the absorbed NH_4 and thus introduce an appreciable error. The absorbed NH_4 can be accurately determined by aeration in the presence of sodium carbonate."

The cobaltinitrite (volumetric) method of estimating potassium in soil-extracts, G. Milne (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 541–552*).—The cobaltinitrite precipitation and volumetric estimation by titration with permanganate, as detailed in this contribution from the University of Leeds, was found to permit the quantitative recovery of the known quantities of potassium used "independently of the presence of alkaline earth sulfates, or phosphates, provided that the amount of potassium is not varied over too great a range. The factor 0.000830 gm. K_2O per cubic centimeter N/10 $KMnO_4$ suits the procedure described over a range of about 3 to 50 mg. K_2O. Outside this range, or for highly accurate work within it, it may be desirable to calibrate the method.

"The method may be applied, in plant-ash analyses, indifferently to the original extracts containing other bases and phosphates or to the mixed sulfates weighed for sodium and potassium together. It is applicable to small-quantity work upon soils with greater exactness and speed than is the perchlorate method. Citric acid extracts can be handled, with a relatively short manipulation, to give satisfactory results." With respect to the manipulative detail here given it is noted that "the object is rather to call attention to

the soundness of the method in at least one of its forms, than to put forward a new modification of it."

A new volumetric method for the estimation of sodium, A. Blenkinsop (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 511–516*).—The principle of the method here reported from the Seale-Hayne Agricultural College is that of the precipitation of the sodium zinc uranyl acetate of the Kolthoff method (E. S. R., 58, p. 608), solution of the precipitate in hydrochloric acid, and reduction of the uranium to the uranous salt, which is "stabilized or even precipitated as uranous fluoride by the addition of hydrofluoric acid," and a titration of the excess of the titanous chloride used as reducing agent with iron-alum, potassium thiocyanate as indicator.

Evaporate the solution containing the sodium, preferably as the chloride, and in an amount not exceeding 12 mg., to dryness in a glass basin of about 20 cc. capacity. Add 15 cc. of the reagent, stir well, and allow to stand for 1 hour. Filter through a 15-mm. diameter Jena glass filtering funnel (porosity G 4) and remove as much of the reagent as possible by suction. Wash the precipitate two or three times with about 2 cc. each time of a saturated solution of the precipitate in 95 per cent of alcohol.

"The uranyl zinc sodium acetate is dissolved in dilute HCl and transferred to a 500-cc. conical flask. About 10 cc. of strong HCl are added and the air in the flask displaced by passing a current of CO_2 gas. Excess of titanous chloride solution is then run in from a burette. While still maintaining a current of the gas through the flask, the latter is shaken and allowed to stand for 2 or 3 minutes, or heated to 40–50° C. to insure the complete reduction of the uranium. Twenty to 25 cc. of 2 per cent HF are then added and about 10 cc. of 10 per cent potassium thiocyanate solution.

"The excess of titanous chloride is estimated by back titration with iron-alum solution to the production of a permanent red coloration. It is generally preferable to add a slight excess of the iron alum and retitrate with titanous chloride until the red color disappears. The end point is sharp and accurate to two drops of the latter solution. The hydrofluoric acid produces a bluish-green solution of uranous fluoride, which is stable and has no effect on the ferric salt. It is often found as an amorphous green precipitate at the end of the titration, especially if excess of HF has been used. A convenient strength for the volumetric solutions is about N/50."

A rapid electrometric method for determining the chloride content of soils, R. J. Best (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 533–540, figs. 2*).—"At the theoretical end-point in the titration of a chloride solution with silver nitrate, the chloride ion concentration is 1.0×10^{-5} at 25° C.," according to the equation

$$E = E^0 - \frac{RT}{F} \ln \frac{1}{[Cl']},$$

in which E^0 for the silver-silver chloride electrode is −0.2245 volt at 25° C., so that the silver-silver chloride electrode potential at the end of the titration of chloride solutions with silver nitrate is −0.521, as calculated by the author of this contribution from the University of Adelaide. As a method for the rapid determination of soil colloids he proposes the use as reference electrode of a quinhydrone half-cell made up in a buffer solution such as to give a positive potential of 0.521 volt so that the indicator point shall be zero potential, followed by reversal of the galvanometer deflection. Making up the quinhydrone half-cell with a buffer solution of pH 3.03, as calculated, was shown to give the desired result, and the end-point variation was within a half-drop when the buffer solution was varied between pH 3.0 and pH 3.3. Variations in temperature between 16° and 25° were also shown both in theory

and in practice to cause variations of not more than a half-drop of the N/35.46 normal silver nitrate solution used.

The silver chloride film for the silver electrode was obtained by making the silver the anode in from 0.1 to 0.01 normal chloride solutions at 2 to 3 milliamps of the current to the square centimeter for one hour. An agar-potassium nitrate bridge was used, and a galvanometer of the sensitivity one division to the microampere was an adequate null point indicator, no potentiometer being required. Equilibrium of electrode potential was found to be attained in three seconds, and "in practice 35 titrations were carried out in four hours." The data given indicate closely agreeing results with soil suspensions as well as with the supernatant clear solution, and close agreement also between the results from the two modes of measurement.

The determination of the readily available phosphorus of soils, E. Truog (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 874–882*).—The following method is a contribution from the Wisconsin Experiment Station:

"Place 2 gm. of 20-mesh soil and 400 cc. of the 0.002 N sulfuric acid [buffer by adding 3 gm. of ammonium sulfate per liter, so as to produce a pH of 3 in the final solution], in a 750-cc. Erlenmeyer flask or other suitable flask or bottle and shake for one-half hour. Filter through S. S. 589 filter paper. Discard filtrate until it comes through perfectly clear. Then place 50 cc. of the clear filtrate in a 200-cc. Erlenmeyer flask, add 2 cc. of the ammonium molybdate-sulfuric acid solution [2.5 per cent solution of ammonium molybdate in 10/N sulfuric acid], and shake well. Then add 3 drops of the stannous chloride solution [a 2.5 per cent solution of stannous chloride dihydrate in 10 per cent hydrochloric acid], shake, and compare with the standard within a few minutes. In making the color comparison with ordinary Nessler tubes it is convenient to proceed as follows: Place the 52 cc. of unknown in a Nessler tube and the standard in a 100-cc. cylinder. Now hold the tube with the unknown together with an empty Nessler tube over a white background and pour standard solution from the cylinder into the empty tube until the colors match. Then read the cylinder to ascertain the amount of standard required."

Further, "it should be noted that arsenic produces exactly the same color as phosphorus, and that reagents, filter paper, and glass often contain appreciable quantities of arsenic. Pyrex glass contains 0.7 per cent arsenic oxide, and the use of new Pyrex vessels will cause serious contamination. All glassware should be thoroughly weathered by treatment with warm sulfuric acid-dichromate solution for at least 24 hours. Filter paper may be tested by tearing up a sheet of it and throwing the shreds into a blank test."

The colorimetric determination of phosphoric acid in hydrochloric acid and citric acid extracts of soils, R. G. Warren and A. J. Pugh (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 532–540*).—The colorimetric determination of phosphoric acid in hydrochloric and citric acid extracts of soils by a method involving the evaporation of the extract, ignition, and acid extraction of the residue with either the Denigès (E.S.R., 44, p. 611) or Fiske-Subbarow (E.S.R., 55, p. 310) method of color development was satisfactory only with light soils in the investigation here reported from the Rothamsted Experimental Station. "Clay soils gave low results owing to the presence of larger amounts of iron. A method is given in which the organic matter and iron are removed by treatment with sodium permanganate and potassium ferrocyanide. The results are in good agreement with the gravimetric method."

The determination of organic carbon in soils, G. W. Robinson, W. McLean, and R. Williams (*Jour. Agr. Sci. [England], 19 (1929), No. 2, pp. 315–324*).—The sulfur dioxide method was experimentally compared with the dry combustion method in an investigation here reported from the University College

of North Wales. The carbon dioxide evolved during Kjeldahl digestion was also determined. In conclusion "it is proposed to estimate the amount of organic carbon in soils by determining the amount of sulfur dioxide produced in the ordinary Kjeldahl digestion. The gaseous products of reaction are passed through standard iodine solution and the excess iodine titrated with standard sodium thiosulfate. Details of the method are given. . . .

"The sulfur dioxide method gives results which average 89.6 ± 1.03 per cent of the combustion figures. It is proposed therefore that the percentage of organic carbon found by this method should be corrected by the factor $100/89.6=1.116$. The percentage recovery of carbon indicated by the proposed method is rather higher for pure substances but still falls short of 100 per cent. The proposed method is applicable to carbonate soils without the necessity for any correction for inorganic carbon. It is likely that soils containing inorganic reducing substances such as sulfides will give high results by the proposed method."

By absorbing the sulfur dioxide in 25 per cent sodium bichromate it was found possible to determine also the carbon dioxide, the gases being let from the bichromate solution into a standard solution of barium hydroxide in a suitable absorption tower. The organic carbon calculated from the carbon dioxide thus determined agreed with that indicated by the sulfur dioxide method. "From data with certain peats it appears that the factor 1.724 for converting organic carbon to organic matter is too low."

A method for measuring time-rate carbon dioxide production, P. Emerson (*Jour. Amer. Soc. Agron., 22 (1930), No. 9, pp. 819, 820, fig. 1*).—The apparatus described and figured in this contribution from the Iowa Experiment Station "differs from the usual absorption tower only in the fact that it is of much greater height and is equipped with an automatic air control. . . . The large absorption tube is approximately 21 in. long. The lower end is gradually tapered to a diameter of ½ in. Provision is made for a nipple to which is attached a tube ½ by 16 in. This smaller tube will hold approximately 45 cc. The arrangement is such that the liquid in the upper portion of the tube is continually disturbed by the passage of air bubbles from which the CO_2 is absorbed. A certain amount of $BaCO_3$ will remain in suspension, but the larger crystals will tend to grow to such a size that they will settle out. They settle into the undisturbed liquid in the tube below, where the amount of floc may be readily measured on the graduated scale."

Of the results obtained it is stated that "preliminary experiments indicate the feasibility of more or less accurately measuring the amount of CO_2 being produced from a given source without titration, also that a continuous record of the time-rate of production may be secured."

Pickling green olives, W. V. Cruess (*California Sta. Bul. 498 (1930), pp. 40, figs. 8*).—The details of commercial scale pickling are discussed on the basis of experimental results, and desirable and undesirable practices are indicated rather fully.

Sevillano, Barouni, Manzanillo, Ascolano, and Mission ranked in this order as suitable varieties.

"All varieties gave better results when picked full size, but still green to partial straw yellow, than when picked at full straw yellow to pink in color.

"Olives stored in brine several weeks before use were found unsuitable for green pickling because of darkening of the color.

"The lye concentration found best was from 1.7 to 2 per cent or 10 to 12° salometer for the Manzanillo, Mission, Barouni and Ascolano; and 1.6 per cent or slightly less, for the Sevillano. The depth of lye penetration found best was one-half to a scant two-thirds to the pit for Sevillano and Ascolano and full

two-thirds to the pit for other varieties. The time required for lye penetration varied with the size of the fruit, lye concentration, and temperature, but for a 2 per cent lye solution the time averaged about 5 hours for Manzanillo and about 6 hours for Sevillano olives under factory conditions.

"The time required for washing lye from the olives sufficiently for barreling averaged about 30 hours, but ranged from 20 to 48 hours, depending on depth of lye penetration, concentration of lye used, frequency of changing the wash water, and the size of fruit.

"Color formed by undue exposure during washing was permanent and greatly decreased the commercial value of the product.

"Olives stored in oak barrels were superior in flavor to those stored in paraffin-lined spruce barrels. Barrels with large head bungs leaked badly and permitted mold growth. Barrels with a single small bung on the side were found best.

"For the Manzanillo, Mission, and Barouni varieties the initial brine concentration found best was 44° salometer; but for Sevillano and Ascolano olives it was found desirable to first place a brine of 20° salometer in the barrels and to increase the salt content progressively and slowly to 28 to 30° in order to avoid excessive shriveling. Brine of 44° decreased to 30° or less during fermentation.

"Addition of a starter of active green-olive brine aided fermentation, as did also the addition of a small amount of vinegar or lactic acid. Addition of dextrose sugar aided fermentation and resulted in increased acidity. By this means it was found possible to obtain any desired degree of acidity.

"Elevation of the temperature to 70 to 80° F. during fermentation proved beneficial but is unnecessary except for olives that are to be 'cured' quickly for early marketing. Fermentation was found to proceed satisfactorily during October, early November, and during the spring and summer months when the barrels were placed in the sun.

"Film yeast and mold were found to destroy the acidity of the brine very rapidly, and when their growth was unchecked spoilage ensued. Exclusion of air by keeping the barrels completely filled and sealed prevented their growth.

"Several kinds of glass containers proved satisfactory. It was found necessary to fill them as completely as possible and to seal them tightly (unless vacuum sealed jars were used) in order to prevent growth of film yeast. Wooden 1-gal. kits permitted evaporation, mold growth, and spoilage. Green olives kept well in cans for a few months but on exposure to air soon turned greenish blue in color. On prolonged storage the cans swelled from formation of hydrogen gas by action of the brine on the tin plate.

"The oil content of California green olives compared favorably with that of imported green olives. The green Manzanillo olives were considerably higher than the Sevillano and Ascolano in oil content."

The manufacture of vinegar, H. Wüstenfeld (*Lehrbuch der Essigfabrikation. Berlin: Paul Parey, 1930, pp. XVI+403, figs. 119*).—The book contains four sections as follows: (1) The history and theory of the acetic fermentation, consisting of two relatively brief chapters on the history of the quick vinegar process and the chemical changes involved in the acetic fermentation; (2) the biology and physiology of the acetic fermentation, comprising nine chapters; (3) technology and management of a vinegar works, containing 36 chapters constituting more than three-fourths of the book; and (4) a brief section on definitions and legal requirements. An appendix deals with the economic development of the (German) vinegar industry, and the volume includes a bibliography and subject index.

METEOROLOGY

Climate, W. G. KENDREW (*Oxford: Clarendon Press, 1930, pp. [XI]+329, pls. 13, figs. 117*).—This is stated to be a treatise, "written primarily for the general reader who wishes to know something of the principles of weather and climate . . . and for those workers who find a knowledge of climatology desirable for the furtherance of their main subject of study. It is nontechnical so far as that is possible." The different parts deal with the scope of climatology; insolation and temperature; pressure and winds; humidity, rainfall, evaporation, clouds, thunderstorms; sunshine and cloud; fog; mountain and plateau climate; the weather of temperate regions; local winds; and some climatic types.

Temperature structure and microclimate [trans. title], R. GEIGER (*Met. Ztschr. [Brunswick], 47 (1930), No. 11, pp. 425–430, figs. 5*).—Observations by means of a thermoelectric method showed very great lack of uniformity in temperature structure in air layers near the ground and at different heights above it, as influenced by wind movement, forest growth, and other factors.

Solar cycles and weather cycles [trans. title], H. H. CLAYTON (*Met. Ztschr. [Brunswick], 47 (1930), No. 11, pp. 442–446, figs. 2*).—This article refers to work of others on this subject and discusses briefly the author's studies of the possibilities of weather forecasting on the basis of variations in solar energy, weather waves, and the amplitudes and phases of various cycles of solar and weather changes.

Agricultural ecology, J. DE SAMPAIO FERRAZ (*Ecologia Agraria. Rio de Janeiro: Min. Agr., Indus. e Com., Dir. Met., 1930, pp. 18*).—This is a critical review, by the director of the Meteorological Service of Brazil, of Azzi's book on the subject, previously noted (E. S. R., 62, p. 314), with special reference to conditions in Brazil.

The alleged desiccation of South Africa, F. E. KANTHACK (*Geogr. Jour., 76 (1930), No. 6, pp. 516–521*).—Evidence is presented supporting the conclusion that there has been no permanent change in the rainfall of South Africa within historic times, but that the general deterioration of the country has been caused by soil erosion brought about by faulty veld management. It is shown that soil erosion is going on at a rapid and increasing rate with intensified run-off and devastating floods. The "only suggested remedy for the repeated appalling drought losses is the introduction of enlightened pastoral farming methods."

SOILS—FERTILIZERS

[Soil chemistry] (*Alabama Sta. Rpt. 1929, pp. 9, 10–13*).—The following items cover the soil work of the station for the year:

Phosphate studies in solution cultures.—An experiment by J. W. Tidmore consisted in growing corn, sorghum, and tomatoes for several weeks in 1,000-liter vessels intended to prevent serious changes in the phosphate concentration of the solution during the experiment. The concentration of the orthophosphate radicle ranged from 0.05 to 0.50 part per million. The maximum growth in each case occurred in the maximum concentration of the phosphate. Corn and sorghum grew well at 0.20 part per million but only a poor growth of the tomatoes was obtained.

It is stated that corn and wheat plants absorbed phosphate more rapidly from acid than from alkaline solutions, but "there was no appreciable difference in the rate of PO_4 absorption from culture solutions having a reaction of pH 4.0, 5.0, and 6.0."

The percentage base saturation of different soils at similar pH values.—"This study was made [by W. H. Pierre] for the purpose of determining to what extent the H-ion concentration of soils represents the condition of soils with respect to the percentage base saturation. Several widely different soils were brought to similar pH values by treatment with lime or acid-forming nitrogenous fertilizers; determinations were made of their content of exchangeable hydrogen and the total exchange capacity. From these values the percentage base saturation was calculated."

A brown silt loam soil of alluvial origin from Mississippi and an Illinois black clay loam proved to be 79 and 62 per cent saturated at pH 5.0, as against but 30 to 40 per cent for most of the Alabama soils tested. Soils of different geologic origin varied widely in percentage of saturation with bases at similar pH values.

Plant growth on acid soils as influenced by H-ion concentration, percentage base saturation, and concentration of aluminum in the displaced soil solution.—Pot experiments carried out in the greenhouse by Pierre showed that a South Carolina Cecil sandy loam failed to yield at pH 4.8 more than about 2 per cent as much sorghum as did the same soil at pH 6.5, whereas a soil from Mississippi gave practically as good a yield at pH 4.5 as at pH 6.5. The displaced soil solution from these soils had about the same aluminum content, so that aluminum injury could not account for the difference. Though such a correlation was not found in all the cases examined, the second of these soils was more than 70 per cent saturated with bases at pH 4.5, while the South Carolina soil, practically infertile at pH 4.8, was less than 30 per cent saturated at pH 4.8.

The fixation of superphosphate by soils as influenced by time of contact.—Twelve soils compared in these experiments, conducted by L. G. Brackeen, were treated with superphosphate at the rate of 600 lbs. to the acre applied 180, 90, or 30 days before planting and at the time of planting. Potassium chloride and sodium nitrate were also applied, and the soils were planted to Sudan grass in pots.

"The heavy soils fixed phosphate to a greater extent than the light soils, as would be expected. A fair correlation existed between the crop yields and the extracted phosphates regardless of the method of extraction. The best correlation was found between yields and the 0.2 N nitric acid-soluble phosphate, and the second best correlation existed between yields and 0.001 N sulfuric acid-soluble phosphate."

Black Belt soil investigations.—Field and greenhouse work carried out by G. D. Scarseth is reported. The field studies reported consisted in an examination of the profiles of eight of the major types and in the collection of greenhouse and laboratory samples.

In the greenhouse "the virgin soils gave no response to potash whereas cultivated soils gave a small response. The outstanding result of these tests was the very great response to phosphorus when applied at the rate of 1,000 lbs. 16 per cent superphosphate per acre. High applications of superphosphate produced extraordinarily increased yields of all crops on all the soil types except on Houston clay and bottom types. On a Eutaw clay the increased growth in oats from 100 lbs. of superphosphate per acre was 2,600 per cent. The soybeans were the least responsive to superphosphate, but on six soils the average increase with superphosphate was 394 per cent."

In the laboratory tests "the pH values of all soil samples collected give some data on the reaction of these soils." Lime requirement tests showed that some of the Black Belt soils needed as much as 5 tons of lime to the acre. Of a monocalcium phosphate application equivalent to 4,000 lbs. to the acre,

more than 99 per cent was made insoluble in a 1:5 soil-water extract in a period of five months. It is stated that "the potash was fixed to a less extent than the phosphorus."

[Soil and fertilizer investigations at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 113–115, 116, 117, 122, 123, 124*).—Soil and fertilizer items reported by this station for the biennium include the following:

Crop rotation.—In a 15-year rotation experiment, the yield of beans was reduced from 12 to 6 bu. per acre under continuous cropping, and increased to nearly 30 bu. by rotation with manure and irrigation.

Sulfur for alfalfa.—Sulfur applications were found to increase the alfalfa yield by about 1 ton to the acre and are reported as used on about 50,000 acres of alfalfa land in the State. Clover was found to give a yield increase of 1.5 tons to the acre with sulfur treatment.

Beneficial results from the use of lime, phosphate, potassium, nitrogen, and barnyard manure are very briefly reported. The yield of mint oil and the length of fiber flax straw were greatly increased by the use of potash on muck soil.

Alkali land reclamation.—In the alkali experiment field at Vale "much of the white alkali has been eliminated and from 50 per cent to 85 per cent of the black alkali has been removed from the first 20 in. of the soil. A 2-ton crop of rye has been grown, followed by a good crop of sweetclover for green manuring, and then alfalfa established and a yield of 4.5 tons per acre obtained on land which was previously considered as barren waste. Several resistant forage crops have been introduced, including Ladino, strawberry, and sweetclover, slender alkali grass, bluegrass, and ryegrass."

Fixation of nitrogen by legumes.—A laboratory determination was made of the effect of Austrian field peas with and without inoculation and with and without fertilizer treatment. "A gain of several hundred pounds an acre of nitrogen has been obtained with some of the most promising treatments."

Search for essential elements.—Manganese, zinc, and iodine appeared to bring about increases in yield under some conditions.

Utilization of peat soils.—"Manure and potassium have proved desirable on all of the soils from the four types of peat recognized in the Northwest. Lime has been helpful on the acid peat of the Willamette Valley and coast sections. These treatments have increased the potassium content of the soil solution and the yield and quality of crops."

Replaceable bases in Oregon soils.—Work in connection with a declining alfalfa yield indicated that "a good supply of exchange calcium seems to be associated with response to sulfate fertilizers."

Longevity of sulfur oxidizing microorganisms.—"It appears that these organisms will live in the sulfur for a few months, and that the duration of life depends somewhat upon the presence of suitable food, moisture, and temperature conditions."

Reclamation of black alkali with different forms of sulfur.—"It appears that sulfur is the best single treatment, that lighter applications can be employed in conjunction with barnyard manure, and that the form of sulfur is not important after the first few months."

Soil fertility.—Fertility trials at the Astoria Substation indicated that "lime is essential to maintain the fertility of the coast soils. After the original fertility is depleted lime is more essential than manure in building up the soil. Legumes can not be grown without lime after the original fertility has been depleted. A good stand of legumes can not be secured or maintained by the application of liberal quantities of manure only. Manure has its greatest

value in increasing production of crops, but lime is necessary to obtain a satisfactory stand. Superphosphate is highly profitable when applied to root crops."

Fertilizer experiments, [Harney Valley Substation].—Barnyard manure and manure reenforced with superphosphate continued to lead in the economic production of crops.

Soil survey of Lee County, Georgia, J. W. Moon *(U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1927, No. 4, pp. 29, fig. 1, map 1)*.—Lee County is an area of 229,120 acres, mostly plains characterized by numerous depressions due to limestone sinks and by "few small surface streams," in southwest Georgia. The present survey, made in cooperation with the State College of Agriculture, lists 22 types of 13 series, the more extensive areas being those of Grady sandy loam 14.7 per cent, Greenville sandy loam 12.5 per cent, Tifton sandy loam 11.9 per cent, and 8.7 per cent of unclassified swamp. The total area too inadequately drained for agricultural use is indicated as about 25 per cent of the county.

Management of cane soils, J. O. Carrero *(Porto Rico Sta. Rpt. 1929, pp. 11–13)*.—The previous year's work (E. S. R., 62, p. 720) has been continued.

Cane tops and trash were added to soil at the rate of 3 gm. of the residues to 200 gm. of the soil, and the decomposition was studied without the addition of lime and with one, two, and three times the quantity of lime required to neutralize the soil. Comparisons were made also of the decomposition rates with and without the ammonium sulfate amounting to 2.5 per cent of the dry weight of the crop residues. A further variation consisted in comparisons of the effect of tops and trash left on the surface with that of like material mixed with the soil. A similar but less extensive trial was made with soybean straw and stems. "The first analysis was made 15 days after the experiment was started and analyses were made at weekly intervals.

"Soils with or without lime treatment showed a small gradual increase in the nitrate-nitrogen content with only an occasional drop. Soils receiving lime made a small but definite gain, and there was a tendency toward slightly larger increases in favor of soils receiving two and three times the lime requirement. Soils receiving nitrogen in addition made considerable gains weekly in nitrate-nitrogen content. The amounts were from three to five times that of the no-nitrogen soils, those receiving lime in addition always showing to advantage. Increases in lime added were followed in the first three-fourths of the experiment by a higher nitrification rate. However, soils receiving only lime and plant material showed no gain. Bare traces of nitrates were always present, amounting to less than 2 parts per million. The nitrate content rose only on one occasion and then from 2.5 to 4.5 parts per million. The nitrate content of soils receiving lime, plant material, and nitrogen in addition was considerable, although in many cases well below the quantity contained by soils receiving lime and ammonium sulfate. However, though this difference amounted to 100 parts per million nitrogen in favor of the no-straw soils during the first half of the experiment, the gains in nitrate nitrogen during the second half were enough to cause this difference to decrease considerably. Again increased addition of lime produced differences in their favor. However, this effect was not constant.

"Soils having lime and plant material as a mulch contained more than traces of nitrates at all times. The nitrate content, however, amounted to only from one-fourth to one-fifth of that in soils receiving no treatment or only lime. After the third week it decreased from one-eighth to one-eleventh. It was only in the last three weeks that they showed again a small upward trend or slight gain. Small gains were also produced by the use of increased quantities of lime.

"Soils receiving nitrogen in addition to plant material as mulch contained nitrates in considerable quantities. The nitrate content was considerably above that in soils having straw mixed with soil and only slightly below that in soils having no straw but receiving the lime and nitrogen addition. Again a steady gain was produced by the use of lime and further gains by its use in increased quantity.

"The greatest decomposition and nitrification were shown by soybean straw and stems."

The availability of the potassium in some Scottish soils, R. Stewart (*Jour. Agr. Sci. [England], 19 (1929), No. 3, pp. 524–532*).—The solubility of the potassium of 34 soil samples from 13 soils "typical of large areas in the East of Scotland" was determined by the author of this contribution from the Edinburgh and East of Scotland College of Agriculture with the use as solvents (1) of hot concentrated hydrochloric acid and (2) of 1 per cent citric acid solution, "and the values obtained compared with the quantities of potash existing in the exchangeable form. The total mineral potash has been determined for six samples, and Neubauer's method of analysis has been applied to 10 samples and again compared with the exchangeable potash."

The average value of the total mineral potassium in the soils examined was 2.04 per cent. No relation was found to exist between the total potassium and the quantities soluble in hot concentrated hydrochloric acid. The average value of the HCl-soluble potassium was 0.50 per cent, and in the profile samples there was generally an increase in solubility with increase in depth of soil. The citric acid soluble potassium had an average value of 0.0074 per cent, which represents only 1.48 per cent of that soluble in strong hydrochloric acid. In the profile samples the solubility generally decreased with increase in depth of soil, with one marked exception.

"The citric soluble potash varied from 26 to 79 per cent of the exchangeable potash with a correlation coefficient of +0.9876, and it is suggested that the citric acid extraction is a case of partial base exchange.

"The figures obtained from the Neubauer seedling analysis indicate a deficiency of available potash in most of the samples examined. On comparison with the corresponding values of the exchangeable potash a correlation coefficient of +0.9888 is obtained, which indicates that the soil's content of exchangeable potash determines the amount of K_2O which can be absorbed by the seedlings."

The Atterberg consistency constants: Factors affecting their values and a new concept of their significance, L. D. Baver (*Jour. Amer. Soc. Agron., 22 (1930), No. 11, pp. 935–948, figs. 9*).—As factors affecting the Atterberg constants, the size and shape of the soil particles, the clay and colloid content, the chemical composition of the colloid, the nature of the exchangeable ions, and the content of organic matter are discussed by the author of this contribution from the Alabama Experiment Station, and "a new concept of the significance of the Atterberg constants" is developed under the subheads of the previous interpretations of their significance, the relation of the Atterberg constants to the dynamic properties of soils, friction and adhesion, compression, and the results of chisel experiments. The experimental work upon which the discussion is based is presented in the form of graphs of the relative changes of pairs of the properties concerned. The conclusions follow.

"The Atterberg consistency constants are affected by the following factors: (1) Size and shape of particles—disk-shaped, colloidal particles impart plasticity to soils. Plasticity increases with the content of these fine particles. A new theory is advanced to explain the plasticity of soils on the basis of the orientation of the platelike colloidal particles. (2) Clay and colloid content—

soils containing a high percentage of clay or colloids possess high plasticities. (3) Chemical composition of the colloid—a low SiO_2-sesquioxide ratio of the colloidal material extracted from soils is associated with a low plasticity range on the moisture scale. (4) Nature of exchangeable cations—the divalent cations tend to increase the plasticity of soils by raising both plastic limits. The K ion decreases plasticity and lowers both plastic limits. The Na ion lowers both plastic limits but increases plasticity. (5) Organic matter content—organic matter causes plasticity to occur at high moisture contents, but does not materially affect the magnitude of the plasticity.

"The following relationships exist between the Atterberg constants and the dynamic properties of soils: (1) Maximum adhesion occurs at a moisture content fairly close to that of the upper plastic limit. (2) Maximum adhesion is proportional to the plasticity number. (3) The moisture range over which adhesion takes place and the moisture content at which maximum adhesion occurs appear to be functions of the plasticity number. (4) The range of maximum compressibility is aprpoximately the same as the plasticity range on the moisture scale. (5) Maximum compressibility is a logarithmic function of the plasticity number. (6) The maximum resistance offered by a soil to the passage of chisels is a logarithmic function of the plasticity number. (7) A double logarithmic relationship exists between the plasticity number and that moisture content at which the resistance of a soil to the passage of chisels begins to increase rapidly. From these results and preliminary work with cohesion and shear, it appears possible to predict, by means of the Atterberg consistency constants, the values of the dynamic properties of any plastic soil."

Wilting coefficient studies, A. V. Capalungan and H. F. Murphy (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 842–847*).—The wilting coefficients of some of the locally important crops were determined in a number of soil types in the work here reported from the Oklahoma Agricultural and Mechanical College, the wax-seal and impervious-pot method having been used.

"Soil texture showed its usual effects on retaining moisture against plant usage. The formula for wilting coefficient secured by the writers was as follows:

$$\text{Wilting coefficient} = \frac{\text{Hygroscopic coefficient,}}{0.61 \pm 0.014}$$

which is not much different than that secured by Briggs and Shantz [E. S. R., 26, p. 628]." The crops examined were found to differ somewhat in their ability to extract the moisture of the soil, oats reducing the soil moisture to a percentage lower than that reached either by barley or by wheat, while the corn variety used showed the least moisture reducing effectiveness.

The state of unsaturation of the soil in relation to its field behavior and lime requirement, P. E. Turner (*Soil Sci., 30 (1930), No. 5, pp. 349–381*).—"There is considerable evidence that hydrogen and calcium together account for the great majority of the exchangeable ions present in the soils of humid climates. Upon the relative proportions in which these ions occur, and possibly also on their absolute amounts, the properties of such soils may be expected to depend. An investigation has therefore been made of the extent to which the calcium-hydrogen status of a series of soils is related to their field behavior, and upon the conclusions reached a method for determining lime requirement has been based."

The paper, which is a contribution from The Imperial College of Tropical Agriculture, has the three parts (1) the measurement of the state of unsaturation, (2) the state of unsaturation of the soil in relation to its field behavior, and (3) the determination of lime requirement on the basis of degree of

unsaturation. Conclusions drawn from the work reported in part 3 are in part as follows:

"*Evidence is adduced that the soils of group 1 [soils possessing an inherent good tilth] are in equilibrium with calcium carbonate. If such is the case, the saturation deficits of these soils are measures of the extent to which hydrolysis can occur, and the degree of unsaturation is a measure of the proportion of the acidoid material hydrolyzed under these conditions. This suggests that the degree of unsaturation of the good soils is a measure of the amount of calcium with which they can stably unite, rather than an indication of the point at which the ratio of exchangeable calcium to hydrogen is such that the former ion exerts a predominating influence over the properties of the soil, although in the good soils such a state of affairs may exist.*

"The limiting values found for the degree of unsaturation of the good soils (12 and 28 per cent) indicate that a considerable degree of variation with the soil occurs in the proportion of hydrolyzed material present under equilibrium conditions. This is probably due to variation in the strength of the acidoid material from soil to soil, a factor which may be influenced by the soil content and nature of humified organic matter. A table has been given of the net amounts of calcium carbonate required to reduce to 20 per cent the degree of unsaturation of soils of varying saturation capacities and degrees of unsaturation. Attention has been drawn to the need for maintaining a reserve of calcium carbonate in the soil, both for the purpose of repressing the ionization of the calcium salts of the acidoid material and of preserving the degree of unsaturation at a value approximating to 20 per cent."

Microbiological studies of some typical Iowa soil profiles, P. E. Brown and T. H. Benton (*Iowa Sta. Research Bul. 132 (1930), pp. 361–420, figs. 18*).—Following a brief introduction and a historical sketch, the bulletin reports three series of experiments in which the results of the microbiological investigation are stated under the subheads depth, moisture, season, cultivation, and soil types. Graphs and tables present the numerical data somewhat fully, and a brief bibliography is appended.

"In general, the results show striking decreases in the numbers of bacteria in the lower soil layers over those present in the surface soils. Variations in the decreases occurring between different horizons were often quite large, and they generally occurred without reference to differences in moisture. There is some evidence of seasonal effects, and there is some indication of an influence from long continuous soil treatment, but the chief factor which is probably responsible for these variations is the natural difference in the physical and chemical characteristics of the lower soil layers. Probably the most important is the difference in the organic matter content, which is reflected in the color of the soil. The texture, however, is also undoubtedly of large significance, particularly when fine textured types are compared with coarse textured soils. Probably all the characteristics which serve to distinguish the individual soil types have an influence on the content of microorganisms in the various soil layers. At least in two cases definite relationships between the soil types studied and the content of microorganisms are shown."

The decomposition of lignified materials by soil microorganisms, M. Phillips, H. D. Weihe, and N. R. Smith (*Soil Sci., 30 (1930), No. 5, pp. 383–390*).—"The present investigation [of the U. S. D. A. Bureau of Chemistry and Soils] was undertaken to determine whether lignin as it occurs in plant materials can be decomposed by the microorganisms found in the soil."

Previous investigations are concisely summarized, the methods used in the determination of pentosans, cellulose, lignin, ash, methoxyl, and nitrogen are given, the nature of the microbiological experiments is indicated, and the following results and conclusions are stated:

The observed decomposition of the pentosans and cellulose was rapid. "Under proper conditions soil organisms are capable of decomposing lignin as found in lignified plant materials. Under suitable conditions the rate of decomposition of the lignin may be as great as that of the cellulose (Cross and Bevan) and pentosans."

The effects of artificial farm manures on soils and crops, F. B. SMITH and P. E. BROWN (*Iowa Sta. Research Bul. 127 (1930), pp. 197–236*).—In their effects upon the yield of oats and upon bacterial activities in the soil, artificial and farm manures appeared, in the preliminary greenhouse and laboratory experiments, to be very similar. "Well-rotted farm manure had a much greater effect on carbon dioxide production in sand cultures than did the artificial manures, but some of the artificial manures produced as large an influence as did the fresh farm manure. The sweetclover manure had a distinct beneficial effect, and the straw manure also increased the carbon dioxide production. The greater influence of the well-rotted farm manure was undoubtedly due to the greater decomposition occurring in that material than in the artificial manures."

Nitrification in sand cultures was at first depressed by both treatments. However, "the artificial manures, in some cases, had a greater stimulative influence on the oats grown than did the farm manure." It was also found that "in the nitrate assimilation experiment in the laboratory, the application of farm manure appreciably stimulated the development of the nitrate assimilating organisms in the Carrington loam. The oats straw and the straw manure brought about a greater stimulation, but the artificial manures in general showed a smaller stimulation on this group of organisms."

In conclusion it is stated that "from the results as a whole it is apparent that the proper composting of straw and cellulose residues may permit the production of artificial manures which will give similar effects on bacteriological conditions in the soil and on crop yields to those occasioned by farm manure. There is a similar stimulation in the nitrification process and in the numbers of organisms, and while nitrate assimilation is also stimulated by the artificial manures, the influence of this process is no greater than that produced by farm manure. While, therefore, there may be a reduced content of nitrates in the soils following the addition of these artificial manures, there is no greater reduction than that brought about by farm manure. As farm manure has a well-known beneficial effect on crop growth, it is apparent that there need be no deleterious effect from well-decomposed artificial manures either on crop yields or on soil conditions in general. In fact it would seem that quite as large beneficial effects should be exerted, and any increase in nitrate assimilation and decrease in nitrate content is more than offset, from a crop production standpoint, by the increased nitrification which is occasioned."

Nitrogen and organic matter as related to soil productivity, W. L. POWERS and R. D. LEWIS (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 825–832*).—"In an earlier report [E. S. R., 58, p. 721] the value of fertilizer application for increasing the concentration of the soil solution and decreasing the water requirements of plants has been demonstrated. The present article is intended to indicate the possibilities for maintaining soil nitrogen and organic matter and consequently efficient use of water and profitable irrigation agriculture through such economic methods as crop rotation and the use of barnyard manure."

A chemical study of Amity silty clay loam samples from 14 plats in the Oregon Station irrigation field was made, some production and profit data were considered, and conclusions, including the following, were drawn from the study as a whole.

"Marked increases in nitrogen and total carbon were found after 16 years from irrigation or crop rotation or use of manure each rotation. The ratio of soil nitrogen to total carbon tended to remain fairly constant throughout the plats studied. The nitrate-supplying power of the soil appeared to increase, but other changes in the supply of readily available nutrients were not definitely significant. Striking differences in crop yield, yield per acre inch, net profit per acre, and water cost of dry matter are found to be related to increases in soil nitrogen and total carbon.

"Insisting that settlers on newly irrigated arid land practice a crop rotation for improving the nitrogen and organic matter content should go far toward insuring economical use of water and establishment of profitable crop production under irrigation."

The leaching out of autumnal dressings of nitrogenous fertilizers, H. H. Nicholson and B. Pantin (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 2, pp. 297–301, figs. 2*).—An investigation conducted at the University of Reading is stated to have supported the conclusion of the Rothamsted Experimental Station "that leaching out may occur any time throughout the winter up to March, or rarely April." It was found that "the loss of nitrates is directly limited by the amount of drainage and so is indirectly determined by the rainfall, and by temperature—as it affects the rate of evaporation. All three nitrogenous fertilizers are shown to lose well over 50 per cent of a normal dressing by leaching out during the winter, but the loss is greatest in the case of sulfate of ammonia, least in the case of rape dust, calcium cyanamide being intermediate."

Nitrogen availability in "based" and unbased ammonium sulfate and ammonium phosphate, A. B. Beaumont and T. R. Swanback (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 9, pp. 811–819*).—This investigation of the commercial product of mixing freshly prepared superphosphate with ammonium sulfate is a contribution from the Massachusetts Experiment Station. It is noted that some heat is evolved in the mixing of the two substances; that the mixture sets or hardens during the curing process; and that the metathesis yielding calcium sulfate and ammonium dihydrogen phosphate "no doubt occurs to a limited extent," although "it is of the reversible type and therefore can not be expected to go to completion in the fertilizer mixture."

Of the experimental methods it is stated that "plants were grown in paraffined zinc Wagner pots of 3 gal. capacity. Treatments were replicated 5 and 10 times; 5 times when several plants were grown, and 10 times when only one plant was grown in each pot. The moisture content of the soils was maintained at 50 to 60 per cent maximum moisture retentive capacity." Sweet corn, lettuce, oats, barley, turnips, and beets were used as test crops.

The conclusion reached was, in the main, that "under the conditions prevailing in the investigation, 'based' ammonium sulfate produced no greater growth of plants than did the unbased and unmixed materials. Further, ammonium phosphate was not superior to either of the forms of sulfate on acid soils supplied with phosphoric acid equivalent to that in the ammonium phosphate. All ammonium salts used tended about equally to produce or intensify acid soil conditions. The soil acidity itself rather than associated indirect effects was the primary cause of the toxic soil condition which existed in some cases."

Rate of intake, accumulation, and transformation of nitrate nitrogen by small grains and Kentucky bluegrass, M. M. McCool and R. L. Cook (*Jour. Amer. Soc. Agron., 22 (1930), No. 9, pp. 757–764, figs. 2*).—The experiments here reported from the Michigan Experiment Station consisted principally in a study of the reaction of nitrogen compounds in the soil to wheat, barley, oats, and bluegrass grown in Hillsdale sandy loam to which were added ammonium sulfate, urea, sodium nitrate, and ammonium phosphate. This and related experiments yielded observations that "the intake by plants of nitrogen added to the soil is very rapid, showing up in the expressed sap in 15 hours after treatment"; that changes in soil nitrate concentration are usually reflected in proportionate changes in the expressed crop sap; that sodium nitrate increased the nitrate content of the plant sap more rapidly and to a greater extent than did ammonium sulfate or phosphate or urea; that nitrate nitrogen was transformed so rapidly that a considerable decrease in the plant sap nitrate content appeared within three hours after removal of the source of nitrate supply; that wheat plants grown in sand cultures did not attain maximum growth, although some of the cultures contained as much as 20 p. p. m. of nitrate; and that "in general, an increase of nitrate nitrogen in the sand cultures was accompanied by increased growth, an increase in the concentration of nitrate nitrogen, and a decrease in the concentration of phosphorus in the expressed sap of the plants."

Relation of nitrates in soils to the response of crops to potash fertilization.—I, Factors contributing to the unproductiveness of "alkali" soils in Illinois, O. H. Sears (*Soil Sci., 30 (1930), No. 5, pp. 325–347, pl. 1*).—Contributed from the Illinois Experiment Station, the present paper presents observations indicating that the lack of productivity in the "alkali" areas examined is due to the two factors of low availability of the soil potassium and excess of nitrogen in the nitrate form. The low availability of potassium was shown to be the result rather of an alkaline reaction than of any serious deficiency of the element in these soils.

Further, "the value for improving the crop-producing capacity of the soils is attributed in part to the potassium which it contains. In addition, the crop is favored by a lowering of the nitrate nitrogen content of the soil resulting from the straw application. This explains the greater efficiency of unburned straw compared to its ashes in increasing yields. For the same reason, horse manure is more valuable than cow manure on these soils, whereas the opposite condition obtains on soils in which a deficiency of available nitrogen is a limiting factor."

The availability of potash in a typical Mauritius soil, N. Craig and R. Lincoln (*Jour. Agr. Sci. [England], 19 (1929), No. 2, pp. 397–403*).—The authors of this contribution from the department of agriculture of Mauritius treated lateritic soils characteristic of the region with potassium salts and observed a gradual increase in the proportion of "nonavailable or nonexchangeable" potassium. In the case of equivalent applications of the two salts, the increase noted was greater in the case of treatment with potassium sulfate than when potassium nitrate was used. On the other hand, "when molasses is applied to the soil there is a decrease in the amount of nonavailable or nonexchangeable potash, showing that the potash in the molasses has remained in the available or exchangeable forms. The decrease is due to the conversion of the nonavailable forms preexisting in the soil into available forms. In the presence of molasses, the potash applied in fertilizers does not revert to an unavailable form, while the potash preexisting in the soil tends to become more available."

"It must be borne in mind, [however], that increases in yield in sugarcane following applications of molasses similar to those recorded in Mauritius have not been encountered in many other sugar-producing countries. It seems reasonable to suppose that the soil conditions in Mauritius may differ from those met with when significant increases are not obtained. The results of this investigation are not, therefore, of general application, but refer only to the lateritic soils found in Mauritius."

Nitrophoska (*Tennessee Sta. Rpt. 1929, p. 51*).—At the Mericourt Substation the comparative effects were tested of 900 lbs. to the acre of a 10–5–5 mixture and of a commercial concentrate of the fertilizer composition 30–15–15 applied at the rate of 300 lbs. to the acre. Both tests were made with and without limestone. A mixture of 2 parts of limestone with 1 part of the concentrate gave the best results, while the concentrated fertilizer alone gave the lowest yields.

A comparison of some effects of blast furnace slag and of limestone on an acid soil, F. H. Crane (*Jour. Amer. Soc. Agron., 22 (1930), No. 11, pp. 968–973, fig. 1*).—From comparison experiments made at the Illinois Experiment Station it was concluded that "on the gross ton basis 100-mesh limestone was somewhat superior to 100-mesh slag in its effects on red clover growth and soil reaction with the soil used, but on the basis of $CaCO_3$ equivalent, as determined by titration using phenolphthalein as indicator, the two materials had nearly the same effectiveness. The $CaCO_3$ equivalent of these materials, as computed from their contents of total calcium and magnesium, was a less satisfactory measure of their relative effectiveness, as shown by clover yields and effects on soil reaction, than was the $CaCO_3$ equivalent obtained by titration. Four-ton applications of granulated slag gave results approximately equal to those from 1 ton of 100-mesh slag."

Normal magnesium carbonate in comparison with "light" and "heavy" oxides and carbonates in the soil, W. H. MacIntire and W. M Shaw (*Jour. Amer. Soc. Agron., 22 (1930), No. 11, pp. 919–934, figs. 2*).—"A comparison of five magnesic materials—'light' and 'heavy' oxides, light and heavy precipitated carbonates, and a crystalline carbonate, $MgCO_3 \cdot 3H_2O$—at 8-ton and 32-ton CaO-equivalent rates was conducted in a 4-year lysimeter experiment [of the Tennessee Experiment Station].

"The crystalline carbonate gave the greatest magnesium outgo for both rates. For the other materials at the 8-ton rate the greater losses of magnesium came from the heavy forms of oxide and carbonate, and the losses from each oxide approximated those from its corresponding carbonate. The magnesium outgo from the 8-ton crystalline carbonate was decidedly greater than that from the 32-ton addition of light carbonate during the first year. At the 32-ton rate, the light oxide gave an outgo greater than that from the light carbonate."

Other results and conclusions are also detailed at some length.

The effect on plant growth of treating soils with copper-carrying pyrite, H. V. Smith (*Jour. Amer. Soc. Agron., 22 (1930), No. 11, pp. 903–915, fig. 1*).—Two types of cupriferous pyrites (1.26 and 1.63 per cent, respectively, of copper) were used, and together with flowers of sulfur were compared with respect to rate of sulfur oxidation at the Arizona Experiment Station in soils comprising a wide range of texture, soluble salt content, and reaction, the effect on barley plants having been observed in pot experiments.

The sulfur content both of Jerome and of Nacozari pyrite was found capable of "fairly rapid oxidation to sulfate." An increase in the sulfate content of the soils was noted, together with a decided drop in the pH value of the acid soils. In alkaline soils, however, little or no pH change occurred.

Copper toxicity did not appear at the rates of application involved, and it is considered that "pyrite, carrying small amounts of copper, may be safely applied to calcareous soils in fairly large amounts." It is noted, however, that "acid soils should be treated with care, unless lime also is used." As further results of the treatment, it is noted that "chemical analyses of the soils indicated the production of too high concentrations of soluble salts in certain soils for best growth, [and] determinations of pH on the soils indicated conditions too acid for optimum plant growth in soils not originally well supplied with lime."

AGRICULTURAL BOTANY

Growth material and growth [trans. title], F. W. Went (*Rec. Trav. Bot. Néerland., 25 (1928), No. 1-2, pp. 1-116, figs. 13*).—A detailed exposition with extended bibliography is given of work bearing upon the relations between materials, growth, tropisms, and related phenomena.

The influence of growth-promoting substances on decapitated flower-stalks of Bellis perennis, I. E. Uyldert (*K. Akad. Wetensch. Amsterdam. Proc., 31 (1928), No. 1, pp. 59-61*).—Experiments are described in this paper in an attempt to induce growth in decapitated flower stalks by means of growth substances from other plants. The results of this work, as tabulated with brief discussion, are claimed to indicate that flower buds (replaced) as well as growth substances from the coleoptiles of *Avena sativa* accelerate considerably growth in the decapitated stalks of *B. perennis*.

An inherent defect in the theory that growth rate is controlled by an autocatalytic process, G. D. Snell (*Natl. Acad. Sci. Proc., 15 (1929), No. 3, pp. 274-281*).—Indicating and evaluating evidence and statements linking, comparatively, rates of growth and types of chemical reactions, the author concludes that owing to the expanding volume of the growing organism the usual equations from the law of mass action are not applicable to the processes involved in the synthesis of new protoplasm; that equations suited to describe the rate of such processes are markedly different from those customarily used; that this fact renders invalid, at least in the present form, the hypothesis that growth rate is controlled by a single or master autocatalyzed monomolecular reaction; but that it does not invalidate the view that the production by geometrical progression of new nuclear material in the fertilized egg is evidence for the autocatalytic nature of the processes involved.

Chlorophyll content and rate of photosynthesis, R. Emerson (*Natl. Acad Sci. Proc., 15 (1929), No. 3, pp. 281-284, figs. 2*).—Of the two sets of factors recognized as affecting photosynthesis rate in green plants, the external ones are known to include light, temperature, and carbon dioxide; the internal ones thus far constitute an indefinite group, the only one yet obvious being chlorophyll. The only work contributing definite information regarding an internal factor is said to be that of Willstätter and Stoll (E. S. R., 43, p. 525).

The photosynthesis rate of cells of *Chlorella vulgaris* varying in chlorophyll content due to treatment indicated was determined in glass vessels attached to two manometers after the method described by Warburg (E. S. R., 56, p. 628). Curves and tabulations are presented.

"Although either lowering the light intensity or decreasing the chlorophyll content decreases the rate of photosynthesis, the characteristics of the process are very differently affected in each case. It is unreasonable to suppose that the light intensity affects anything but the photochemical part of the process. The amount of chlorophyll must also affect this part, and in the same way. However, since the characteristics of the process (sensitivity to temperature

and to prussic acid) can not be similarly altered by changing chlorophyll content and light intensity, it must be supposed that chlorophyll plays some other part in the process besides its rôle in the photochemical reaction."

The relation between maximum rate of photosynthesis and concentration of chlorophyll, R. EMERSON (*Jour. Gen. Physiol., 12 (1929), No. 5, pp. 609–622, figs. 3*).—In amplification of the account above noted the author describes a method for varying the chlorophyll content per unit volume of cells of *Chlorella vulgaris*, maintaining other factors constant. Experiments are described which show that the maximum rate of photosynthesis is a smooth function of the chlorophyll content.

Photosynthesis as a function of light intensity and of temperature with different concentrations of chlorophyll, R. EMERSON (*Jour. Gen. Physiol., 12 (1929), No. 5, pp. 623–639, figs. 3*).—Continuing the above work, the author varied chlorophyll in connection with other factors. It was found that photosynthesis reaches its maximum rate at about the same light intensity over the whole range of chlorophyll concentrations studied, and over this range the process shows the same relationship to temperature, the value of the temperature characteristic decreasing gradually as the temperature rises. The photosynthesis rate is more depressed by prussic acid as chlorophyll concentration lowers.

These results are interpreted as indicating that photosynthesis may involve an autocatalytic reaction, and that chlorophyll plays some part in the process in addition to its rôle in light absorption.

The concentration effect in Nitella, W. J. V. OSTERHOUT and E. S. HARRIS (*Jour. Gen. Physiol., 12 (1929), No. 6, pp. 761–781, figs. 12*).—A method distinguishing between the concentration effect due to the cell wall and that due to the protoplasm is described as important in revealing the fact that one or both ions of the salt tend to enter the outer surface of the protoplasm. The results of studies on Nitella with KCl are presented. Hypothetical diagrams are given of the electrical conditions in the cell.

"If we define the chemical effect as the P. D. observed in leading off at two points with equivalent concentrations of different salts we may say that the chemical effect of the protoplasm is very much greater than that of the cell wall."

Water relations of cultivated plants [trans. title], T. DEMIDENKO (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 383–426, figs. 3; Ger. abs., pp. 424–426*).—Details and tabulations are given regarding the behavior, under differing soil water supply conditions, of a number of groupings of cultivated plants.

Influence of stimulation on development in sugar beet [trans. title], A. V. PETERBURGSKIĬ (A. W. PETERBURGSKY) (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 357–382, figs. 2; Ger. abs., pp. 381, 382*).—Sugar beet seed was subjected to the hypothetically stimulating influences of $MnSO_4$, $NaNO_3$, HCl, H_2SO_4, NaOH, tannin, and certain proprietary preparations at concentrations indicated as ranging widely. Detailed results are stated to show for most of these substances a negative effect as regards sprouting, weight, and sugar content. A certain disinfecting effect was observed in case of Uspulun.

Nutritive solutions having stable reaction (pH) during the vegetative period [trans. title], SH. R. TSINTSADZE (SCH. R. ZINZADZE) (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 307–356, figs. 10; Ger. abs., pp. 354–356*).—Results are given of nutritive tests with *Triticum vulgare, Hordeum distichum, Fagopyrum esculentum, Soja hispida, Secale cereale,*

Panicum miliaceum, *Sorghum effusum*, *Pisum sativum*, *Linum usitatissimum*, and *Avena sativa*.

The physiology of nitrogen applications, H. D. HOOKER (*Ill. State Hort. Soc. Trans., 62 (1928), pp. 196–208*).—Emphasis is laid on principles and plans pointed to as favoring coordination and harmony between carbohydrate-making and nitrogen-obtaining functions and processes, particularly in graft-formed apple trees.

Behavior of assimilating plants toward ammonium nitrate [trans. title], D. N. PRIANISHNIKOV (PRIANISCHNIKOW) and V. S. IVANOVA-SKOSYREVA (W. S. IWANOWA) (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 7–16; Ger. abs., p. 16*).—At all concentrations, growing plants took up ammonia more rapidly than nitric acid.

The influence of carbohydrate supply on the behavior of seedlings toward ammonium nitrate [trans. title], D. N. PRIANISHNIKOV (PRIANISCHNIKOW) and V. S. IVANOVA (W. S. IWANOWA) (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 277–286; Ger. abs., p. 286*).—Etiolated seedlings take up during early developmental stages more ammonia than nitric acid; the inverse occurs during later stages, when carbohydrate has become more or less exhausted.

Ammonium sulfate, nitrite, and nitrate as nitrogen sources for sugar beets at different pH values of the nutrient medium [trans. title], I. G. DIKUSAR (J. G. DIKUSSAR) (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 287–306, figs. 3; Ger. abs., p. 306*).—The influence of ammonium sulfate, nitrite, and nitrate as nitrogen sources on the development of sugar beet depends greatly upon the pH value in the nutritive medium, regarding which particulars are given.

Factors influencing the behavior of plants as regards difficultly soluble calcium phosphate [trans. title], V. V. BUTKEVICH (W. W. BUTKEWITSCH) (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 159–208, figs. 14; Ger. abs., pp. 207, 208*).—The availability of difficultly soluble calcium phosphate to plants depends primarily upon the characters of the soil solution influenced by the concentrations of the Ca-, HCO_3-, and H- ions, as particularized.

Effects of carbon dioxide increase on growth in the sugar beet [trans. title], Z. I. ZHUBBITSKIĬ (Z. J. ZUBBICKI) (*Izv. Selsk. Khoz. Akad. (Ann. Acad. Agron., Petrovsk.), 1928, No. 2, pp. 427–444, figs. 8; Ger. abs., p. 444*).—When a heightened CO_2 percentage was supplied to sugar beets, an increase was obtained in root, sugar, leafage, and ratio of root to leaf.

Products of carbon dioxide assimilation in Tropaeolum majus [trans. title], M. C. KEULEMANS (*Rec. Trav. Bot. Néerland., 25 (1929), No. 3–4, pp. 329–389, pl. 1*).—Having conducted a quantitative research employing biochemical methods described, the author states that as the result of carbon dioxide assimilation in leaves of *T. majus* sugar and starch are simultaneously produced. No sharp line can be drawn between sugar and starch plants. For the sustenance of the leaf of *T. majus*, a certain amount of monosaccharide is indispensable. The first product of assimilation is a monosaccharide. The equilibrium between sugar and starch and their formation are conditioned primarily by genotype and secondarily by external conditions. The results in leaves of severe water loss are an increase in the production of saccharose and of monosaccharide and a notable decrease in the production of starch. Starch exhaustion does not occur quickly in the intact leaves, though in case of severe drying it may be observed in connection with starch migration. Toward evening increased production of starch occurs, supposedly due to the transformation of saccharose. Under favorable conditions, the

highest assimilation rate is attained before noon, though the leaf continues to assimilate after that time.

Respiration of Phycomyces, S. R. DE BOER (*Rec. Trav. Bot. Néerland., 25 (1928), No. 1–2, pp. 117–240, figs. 44*).—An account is detailed of studies on the respiration of *P. blakesleeanus* (*P. nitens*).

No direct influence of light on respiration was detected. It was found that from a heterogeneous culture medium the fungus by preference takes fat, and that on this medium the respiration is more intense than on starch media. The fungus can not live anaerobically, and is sensitive to oxygen decrease. Respiration adapts itself quickly to new temperatures. At harmful temperatures the consumption of fat changes into a consumption of carbohydrates. The respiration on carbohydrate media is an almost linear function of the temperature.

The occurrence of chlorates in a tomato soil, O. OWEN (*Jour. Pomol. and Hort. Sci., 7 (1929), No. 4, pp. 270–275, pls. 2*).—Early in 1927, a case was noted of severe growth-checking injury in tomato plants within certain areas inside two growing houses. Soon after the plants were set out the lower leaves dried and eventually dropped, the tops of the tomatoes showing a peculiar mosaic-like leaf mottling, with spots on the stems, and the plants in many cases finally dying. A large sample of the soil from the houses thus affected was found to contain the toxic principle, but somewhat irregularly distributed, so that some plants might on a hot day show wilt symptoms in 2 hours while others might remain apparently normal for 24 hours.

The potency of the toxic factor appeared when on a hot day a tomato plant well established in normal soil pushed its roots through the bottom of the pot into a small amount of the toxic soil, soon afterward showing typical symptoms.

Experimentation outlined suggested that the toxic substance sought for was inorganic, and it was shown that the toxicity was not due to chlorides or sulfates. "That it could only be a chlorate was amply proved by pot experiments in which baked soil was used and each of the possible compounds added as sodium and potassium salts. . . . The chlorates alone reproduced the effects observed on plants growing in the toxic soil. . . . The origin of these chlorates has not been traced. . . .

"In conclusion, it is interesting to note that at the conclusion of the 1927 season the soil in the houses where the plants were affected was steamed, and during the following season tomato plants were grown in the soil without any ill effects."

GENETICS

The incidence of human multiple births, W. W. GREULICH (*Amer. Nat., 64 (1930), No. 691, pp. 142–153, fig. 1*).—From a study of data on 120,061,398 confinement cases in 21 countries, it was found that among these, twins, triplets, and quadruplets were born at the rate of 1 in 85.2, $(87.3)^2$, and $(87.5)^3$ pregnancies, respectively. There was, however, much variation in the data from the different countries.

The history of biological theories, E. RÁDL, trans. by E. J. HATFIELD (*London: Oxford Univ. Press, Humphrey Milford, 1930, pp. XII+408*).—Numerous biological theories are presented in this translation of the work previously noted (E. S. R., 24, p. 574). The theories are taken up under the headings of the advent of Darwinism, Charles Darwin, Alfred Russell Wallace, the reception of the Darwinian theory, criticism of Darwinism by those still in favor of the older schools of thought, evolutionary philosophy and ethics, the influence of the Darwinian theory in other fields of intellectual activity, Darwinism and

religion, beauty in the world of living organisms, mimicry, progress and decay, Ernst Heinrich Haeckel, spontaneous generation, anthropology, human races, Darwinian morphology and embroyology, the geographic distribution of animals and plants, paleontology, natural selection, Carl von Nägeli, the cell theory after the time of Darwin, human heredity, the later history of the theory of natural selection, psychology, the Lamarckians, genetic ideas in botany, the doctrine of individuality, species and subspecies and their use in classification, reproduction, hybridization, the mechanistic view of development, Driesch, Darwinism in decline, and the nature of scientific history.

The genetical theory of natural selection, R. A. Fisher (*Oxford: Clarendon Press, 1930, pp. XIV+272, pls. 2, figs. 11*).—The author's views regarding the genetical theory of natural selection are set forth, natural selection being differentiated from evolution. The subjects under which the theory is presented are as follows: The nature of inheritance, the fundamental theorem of natural selection, the evolution of dominance, variation as determined by mutation and selection, sexual reproduction and sexual selection, mimicry, man and society, the inheritance of human fertility, reproduction in relation to social class, social selection of fertility, and conditions of permanent civilization.

Portions of the theory advanced regarding natural selection have been noted from other sources (E. S. R., 62, p. 28).

The determination of intra-class and inter-class equivalent probabilit coefficients of correlation, J. A. Harris, B. Gunstad, and M. M. Ness (*Ame Nat., 64 (1930), No. 691, pp. 115–141*).—Attention is called to the disadvantage of comparing empirical frequency distributions with theoretical distributions i cases where the observations must fall in one of two classes. "Methods o forming fourfold tables representing the possible permutations of the ind viduals of the same class are given in terms of the moments of the frequenc distributions. This makes possible the expression of the relationship betwee the character of individuals of the same class in terms of Pearson's equivaler probability correlation coefficient."

A note on Fisher's theory of the origin of dominance, and on a correla tion between dominance and linkage, J. B. S. Haldane (*Amer. Nat., 64 (1930, No. 690, pp. 87–90*).—In further discussion of Fisher's article, previously note (E. S. R., 63, p. 24), "it is suggested that dominance may be due to either c three causes: the Fisher effect in rare cases, the overactivity of normal gene due to a modified Fisher effect in most cases, and duplication of a section c chromosome in still a third small group."

The inheritance of color and horns in blue-gray cattle, II, J. M. Evvar P. S. Shearer, E. W. Lindstrom, and A. D. B. Smith (*Iowa Sta. Research Bu 133 (1930), pp. 16+[1], figs. 12*).—Data are presented in addition to those pre viously noted regarding the inheritance of color in blue-gray cattle (E. S. R 36, p. 168). The further breeding work with the F_1 and F_2 individuals fror the Galloway-Shorthorn cross indicated that the recessive whites breed true.

A consideration of the relation of the white with dark points to similarl marked Wild White Park cattle of Great Britain led to the conclusion that th whites with dark points differ only in the degree of pigmentation resultin from a different genetic composition. The presence of pigment in the ear showed dominance over the almost complete lack of pigment at this point. A white with red points was also obtained.

Matings of the whites with dark points to an Ayrshire bull with a few re markings resulted in the production of blue-gray offspring only, from which it i concluded that the two types of white were genetically different.

The nature of the roan color character in Shorthorns is discussed. It is note that two white cows when mated to self-colored bulls produced self-colore

lves. This seemed to disprove the hypothesis that roan is the simple heterogote between self-pigmented and white.

Inheritance of disease resistance in animals, L. J. COLE (*Amer. Nat., 64* *930), No. 690, pp. 5–14*).—Some of the difficulties encountered in the study of e hereditary basis of disease resistance in animals and the application of the sults to the breeding of large animals are pointed out.

The apparent inheritance of an acquired character and its explanation, : H. MORGAN (*Amer. Nat., 64 (1930), No. 691, pp. 97–114*).—In preliminary xperiments it was found that when the red pigment from the eyes of Drosohila was taken into the digestive tract of larva the granules in the Malpighian ubules were stained red. Burning the eyes with a hot needle produced a imilar result.

From a study of 24,567 offspring of flies having their eyes or wing pads urned, there was no evidence that severe injury to the eyes brought about a reponderance of inherited effects in the eyes or other organs.

The author concludes by pointing out that although the effects of the serious peration were negative, "it does not follow . . . that other kinds of reatment may not be found that will give positive results either indirectly, y first affecting the general physiological condition of the body, or directly, y acting on the germ cells."

Studies of developmental anomalies in the descendants of X-rayed mice, W. S. MURRAY (*Mich. Acad. Sci., Arts, and Letters, Papers, 10 (1928), pp. 509–587, pls. 3, figs. 17*).—Using mice from the X-rayed stocks of Bagg and Little (E. S. R., 52, p. 131), the author found that abnormalities in the feet ranged from those with little indication of digits to others practically normal. The abnormal foot characteristic appeared to be inherited hypostatic to the normal, but the incidence varied in different strains. The abnormal condition could not be explained on a single gene basis. The action of modifying factors for normal appeared in crosses with outside strains, and factors modifying abnormal appeared in crosses with the normal Bagg stock. The abnormal condition of the feet seemed also to be associated with an eye defect.

Grayed hair as an index of relative effective X-ray dosage in the house mouse, C. E. KEELER (*Amer. Nat., 64 (1930), No. 691, pp. 188–190, figs. 2*).—Three black mice were treated over the hinder parts with X-rays. One was fertile for 4 days and sterile for 39 days, and the other two were sterile at once, one continuing so for 47 days and the other for 61 days. The amount of gray hair resulting from the treatment was in order of the duration of the sterility, and is suggested as an index of the effective sterilization dose.

A sex-linked character in ducks, R. C. PUNNETT (*Nature [London], 126 (1930), No. 3185, p. 757*).—Attention is called to a sex-linked down color in ducks which has been observed in crosses of mallard with Indian runner ducks. Of 47 hybrid offspring produced, 27 males had a dark type of down while the 20 females had a much lighter down.

Effect of placental extracts on ovarian stimulating properties of anterior hypophysis, J. C. BURCH and R. S. CUNNINGHAM (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 4, pp. 331, 332*).—In studies of the effect of placental xtracts on the ovarian stimulating properties of anterior hypophysis, adult astrated female rats were given daily injections for 6 days of 5 to 25 rat nits of a commercial alcoholic extract of human placenta. At the end of his time the anterior lobes of the hypophyses were implanted into 32 infantile nice with 16 others as controls. The experimental group showed uniformly arger ovaries when sacrificed on the fourth day of the experiment and from 3 to 8 hemorrhagic follicles were found in the ovaries, whereas 2 or 3 at the nost were observed in the ovaries of the controls.

Effect of oestrin on gonad stimulating power of the hypophysis, R. K. Meyer, S. L. Leonard, F. L. Hisaw, and S. J. Martin (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 7, pp. 702–704*).—In this study 34 immature female rats varying in age from 30 to 40 days were injected with 2 rat units per day of an oil-soluble preparation of the oestrous hormone from the amniotic fluid of the cow. After 30 to 70 days the pituitary glands from these animals were implanted into female rats varying from 20 to 30 days of age. Studies of the variation in the rats injected with the oestrous hormone showed that the ovaries weighed 40 per cent less than the ovaries of 28 controls injected with a like amount of Mazola oil. The pituitaries of the oestrin-injected rats opened the vaginas of the recipients of the implants in from 9 to 25 days, whereas the vaginas of control recipients which received pituitaries from the control donors opened 4 to 5 days after implantation.

In another series of experiments castrated male and female rats were used as recipients of the injection of 4 rat units of the oestrum-producing hormone daily for 31 days, after which their pituitary glands were implanted into immature females. The vaginas of the females receiving the pituitary implantations from experimental and control castrated animals opened at about the same time, but the ovaries of recipients which received pituitaries from oestrin-injected castrate females weighed 35 per cent less than the ovaries of the recipients of pituitary implantations from castrated females not injected with oestrin. It thus seems clear that the oestrum-producing hormone inhibits normal development of the ovary and decreases the gonad stimulating power of the hypophysis.

Effect of a diet low in salts on oestrous cycle of albino mouse, J. M. Wolfe (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 4, pp. 333*).—A diet of casein, dextrin, Crisco, cod-liver oil, and yeast, which was low in salts, was found to lengthen materially the oestrous cycle in rats so that only 25 per cent of the cycles were in the 4- to 5-day range. In the control group 70 per cent of the cycles were of the 4- to 5-day length. It was evident that the oestrous cycle was affected much more than the growth ability as a result of the diet differing in minerals, indicating that the oestrous cycle is a more delicate indicator of the well-being of the animal than is the growth curve.

Relation of weight of placenta, cord, and membranes to weight of infant in normal full-term and in premature deliveries, S. B. D. Aberle, W. R. Thompson, and E. H. Pitney (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 6, p. 586*).—A study of the relation between the weight of the infant and the weight of the placenta, cord, and membranes was made in 4,129 cases divided into two classes, one for the fetuses weighing under 1,500 gm. and the other for those weighing 1,500 gm. or more, with the sexes separated in the latter group. In each case there was a positive correlation of approximately 0.5.

FIELD CROPS

[Agronomic experiments in Alabama, 1929], R. Y. Bailey, F. E. Bertram, H. B. Tisdale, J. T. Williamson, W. H. Pierre, W. A. Gardner, J. F. Duggar, C. L. Isbell, R. W. Taylor, and W. D. Kimbrough (*Alabama Sta. Rpt. 1929, pp. 5–9, 10, 21, 22, 25, 26, 30, 31, 32, 33, 34*).—Field crops investigations (E. S. R., 64, p. 129) reviewed for 1929 included varietal and fertilizer tests with cotton, corn, potatoes, sweetpotatoes, and winter legumes; breeding work with cotton and corn; comparisons of crops and mixtures for hay; cutting experiments with kudzu (E. S. R., 62, p. 520); spacing tests with potatoes; and crop rotations.

During 4 years cotton, after vetch turned under March 25 and April 5 and 15, made its highest yields after that turned under March 25, while corn produced the most grain after vetch plowed in on April 15. The relative returns after vetch and sodium nitrate are compared. Seed cotton yields differed little with ammonium sulfate and sodium nitrate on limed areas, whereas without lime sodium nitrate resulted in much the better yields. Superphosphate used with winter legumes caused substantial increases in the yields of cotton following, evidently by stimulating the growth of the legume. More seed cotton was obtained by supplying two-thirds of the superphosphate and potash to the winter legumes and one-third to the cotton than by giving all to the legume.

Of summer legumes tested in rows, *Crotalaria sericia*, *C. striata*, *Sesbania* sp., and Florida beggarweed showed promise in luxuriance of growth and prolific seeding habits. On Norfolk sand loam soil without artificial inoculation no tubercles developed on the roots of the erect jack or sword bean, Lima bean, Sesbania, Daubentonia, white Schrankia, black locust, or *Dolicholus minimus*, whereas artificial inoculation was not needed for abundant nodule formation on roots of moth bean, mung bean, *Strophostyles helvola*, and on all species of Crotalaria tested. For plantings made about October 1 in 1925, 1926, and 1927 the days between the emergence of the seedlings and the presence of one nodule or more on at least 85 per cent of the plants averaged for monantha vetch 6.7 days, woolly pod vetch 7.3, hairy vetch 8.3, Hungarian vetch 8.3, bitter vetch 12.3, Winter field pea 6.7, Tangier pea 8, sweet pea, 16.7, and Scotch vetch 17 days. Deferring the planting beyond October 7, with consequent decrease of temperature, resulted in a marked increase in the interval between germination and generalized nodule formation. For hairy vetch planted about October 1 this interval averaged 8.3 days, November 1 10.7 days, and December 1 24.3 days, and for Winter field pea 6.7, 13.3, and 28 days respectively.

Earlier results on the effects of removing tops from sweetpotatoes and on changes in composition due to storage treatments were confirmed. Sweetpotatoes with tops removed were higher in percentage of moisture and sucrose and lower in total carbohydrates and starch than untreated sweetpotatoes. As in 1926, frosting of tops had the same effect. Curing caused a shrinkage of about 2 per cent, and cured, dry-ventilated sweetpotatoes shrank from 2 to 4 per cent more than cured, humid-ventilated sweetpotatoes. More of the cured, dry-stored, unventilated sweetpotatoes rotted due to fermentation and fungus than those uncured, humid-stored, and humid-ventilated or of any other treatment.

Differences due to fertilizer treatment were not apparent in the keeping of potatoes grown in the spring of 1928 and stored over winter. Potatoes from the less vigorous plants contained less moisture and more starch, and differences apparent after digging remained during storage. Tubers grown on plats receiving potassium chloride or potassium sulfate did not differ appreciably. Potatoes on new ground in the spring of 1929 responded to nitrogen, phosphorus, and potassium in order. Potassium sulfate surpassed the chloride very slightly, whereas sodium nitrate and ammonium sulfate outyielded cottonseed meal as nitrogen sources. Yield increases also came from side dressing with potassium chloride potatoes receiving complete fertilizer.

[Agronomic investigations in Oregon] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 13, 19, 90–97, 117, 123, 124, 125, 126, 130, 131, 132–134, 138, 142, 143*).—Continued experiments (E. S. R., 61, p. 26) reported on from the station and substations, often in cooperation with the U. S. Department of Agriculture,

embraced variety trials with winter and spring wheat, oats, and barley, corn, rye, flax for seed and fiber, soybeans, vetch, alfalfa, red clover, sweetclover, miscellaneous grasses and forage legumes, sunflowers, potatoes, turnips, carrots, mangels, and rutabagas; breeding work with wheat, oats, barley, and corn; cultural (including planting) tests with wheat, alfalfa, red clover, potatoes, and Austrian Winter field peas; fertilizer trials with wheat, alfalfa, flax (E. S. R., 60, p. 37), pasture, and potatoes; cutting tests with alfalfa; pasture studies; weed control investigations; irrigation tests; and crop rotations. New varieties of merit included Oro, Regal, and Arco wheat, Bortfeld turnip, and Union Beardless barley.

Austrian Winter field peas were found to do best on a well-prepared seed bed and not to be suited for stubbling in, and to be as susceptible to aphids as common vetch and subject to attack by pea weevil. A gain of several hundred pounds of nitrogen per acre was obtained with some of the most promising treatments given this crop used for green manure. Both manure and lime appeared to decrease the amount of winterkilling of annual legumes grown at Astoria.

On burned-over land in the higher part of the Coast Range, where plants must compete with bracken fern and where high acidity and low content of nitrates and lime make soil conditions unfavorable, burning in late August with immediate seeding in the ash proved superior to other methods. The grasses best adapted were orchard grass, redtop, English ryegrass, timothy, and reed canary grass.

Irrigation trials with pasture mixtures showed that from 20 to 30 in. of irrigation water was needed. Rotation grazing alternated with irrigation seemed necessary in order to provide good pasture continuously. Fertilizers, especially nitrate, have quickened growth in spring and sustained it through the season. In the coast section superphosphate helped to establish a stand and proportion of clover in pasture mixtures and increased the nutrient value of the pasturage.

Manure applied at the rate of 8 tons per acre to alfalfa at the Umatilla Substation was more valuable and effective than 32 tons. Alfalfa stands were reduced considerably by cutting at the bud and at the 10 per cent bloom stages. The annual yields rose and quality of hay decreased as the period of growth was prolonged. Early March seedings gave best stands.

Turning under as much as 2 tons of straw and stubble per acre resulted in slightly higher average yields of wheat at the Sherman County Substation than where the stubble was burned. The lack of a significant increase in the yield of wheat where common fertilizer materials were applied suggested that the average Columbia Basin wheat land, if properly handled, plowed early, and the fallow kept weed free, will not respond to the use of commercial fertilizers. In continued tillage experiments (E. S. R., 47, p. 533; 49, p. 828) the 17-year average acre yields of winter wheat after fallow were highest on April 1 plowing, 28.2 bu., and were followed by plowings May 1, 27 bu., in early fall 26.3, in late fall 25.1, and June 1, 22.9 bu. Winter wheat after fallow plowed 10 in. deep averaged only 0.3 bu. more than after fallow plowed 5 in. deep. Yields in comparative tests with winter and spring wheat on fallow suggested the possibility of substituting disking for plowing on many of the lighter soils of the Columbia Basin.

Potato seed kept cool and moist for 48 hours or longer after cutting could better withstand unfavorable conditions than freshly cut seed, which was the more easily harmed by soil fungi and sunlight. Exposure of freshly cut seed to sunlight for 3 hours reduced the stand from 30 to 50 per cent. Early or late plantings normally gave better results than intermediate dates.

Jerusalem artichoke was found by the Southern Oregon Substation to thrive on creek-bottom soils, yields ranging from 15 to 20 tons per acre on different soil types and the sugar content being 23 per cent.

Sodium chlorate and a commercial chlorate applied at the rate of 3 lbs. per square rod appeared to be effective in controlling Canada thistle, morning-glory, and quack grass, whereas other chemicals were unsatisfactory. A second spraying of sodium chlorate seemed necessary for a complete kill at the Eastern Oregon Substation, and the effect on the soil was quite evident after 4 years.

[Field crops work in Tennessee], C. A. Mooers, L. S. Mayer, S. H. Essary, J. A. McClintock, and B. P. Hazlewood (*Tennessee Sta. Rpt. 1929, pp. 12–20, 39, 43, 44, 46, 47, 51, 52*).—Agronomic experiments at the station and substations, reviewed for 1929, embraced variety trials with corn, cotton, lespedeza, potatoes, and sweetpotatoes; breeding work with corn and cotton; fertilizer tests with cotton and sweetpotatoes; and pasture experiments.

Corn improvement work in cooperation with the U. S. Department of Agriculture resulted in several promising crosses between inbred lines of Neal Paymaster, Jarvis Golden Prolific, and Delta Prolific. In state-wide regional type tests strains of certified Neal Paymaster averaged 66.2 bu. per acre, other white varieties 55.7, all yellow varieties 53.4, and Jarvis strains 53 bu. Neal Paymaster strains at the station led the white dents in average percentage of marketable corn. The strain tests during 3 years indicated that corns from outside the State usually are outyielded by native varieties, and that the semiprolifics are more productive than either one-ear or true prolific types. Growers carefully field-selecting seed from healthy standing stalks were maintaining the yields of their strains. Thompson Prolific, a new variety, proved to be early maturing and similar to Jarvis Golden in yield.

All cotton varieties opened first at Jackson, next at Murfreesboro, and last at Knoxville, several weeks intervening between Jackson and Knoxville. It appeared that cotton growing in the altitude of Knoxville would be profitable only under conditions favorable to maturity and with favorable price levels. Varieties indicated for the northern limits of cotton production included Trice, Lightning Express No. 7, early strains of Acala, and D. & P. L. 4–8. Results at Jackson showed that the longer lint varieties averaged higher in money value than the short varieties. Such short growths as Half-and-Half were considered at a disadvantage in both domestic and foreign markets.

On poor land at the West Tennessee Substation sweetpotatoes receiving 100 lbs. of sodium nitrate alone made 200 bu. per acre and unfertilized only 100 bu. Close spacing of plants seemed to give higher yields of all varieties. A bunch strain of Porto Rico compared favorably in yield with a vining strain and was easier to cultivate and harvest. Crop rotations of from 2 to 3 years apparently were not long enough to rid the soil of black rot fungus.

Kentucky bluegrass and white clover was the leading pasture combination at the Middle Tennessee Substation. Steers without supplemental feeding gained during the season 425 lbs. per acre on bluegrass and white clover, 151 lbs. on lespedeza, and lost 124 lbs. on kudzu and 247 lbs. on sage grass. A new perennial lespedeza continued to be most promising. At the Mericourt Substation tobacco following lespedeza was better in yield and quality than that after other crops.

[Field crops work in Porto Rico in 1929], D. W. May, T. B. McClelland, and R. L. Davis (*Porto Rico Sta. Rpt. 1929, pp. 5–8, 16, 19–21, 22, figs. 3*).—Breeding work, trials of seedlings and hybrids, and seed viability tests

(E. S. R., 62, p. 522), all with sugarcane, and field corn improvement, cultural tests with yautias, dasheens, taros, and sweetpotatoes, and a study of variation in the productiveness of hills of dasheens are reported on briefly as heretofore (E. S. R., 62, p. 731), and the merits of garden peas, velvetbeans, and soybeans for food, feed, or forage on the island are commented on.

Flaxseed production by power farming methods in the northern Great Plains, A. C. DILLMAN and E. A. STARCH (*U. S. Dept. Agr., Farmers' Bul. 1650 (1930), pp. II+17, figs. 11*).—Applicable to areas in northeastern Montana and the Dakotas where seed flax can be grown by power farming methods, this publication gives information on conditions for the enterprise, crop sequences, tillage, varieties, cultural, harvesting, and storage practices, and production costs. The results presented are based partly on experiments by the Montana Experiment Station.

Rate of planting potatoes with some reference to sprouting habit and size of plants, J. BUSHNELL (*Ohio Sta. Bul. 462 (1930), pp. 20, figs. 3*).—Sets of the Russet Rural potato variety ranging in weight from 0.5 to 2 oz. were compared on Wooster silt loam at different distances between hills, and plantings were made both early and late to determine the importance of the degree of multiple sprouting (E. S. R., 61, p. 32).

At the same spacing 2-oz. sets outyielded 1-oz. sets but not enough to compensate for the larger quantity of seed used, i. e., the net yields were similar from 1-oz. and 2-oz. sets. The 1-oz. sets produced larger plants than 0.5- or 0.75-oz. sets, and slightly, yet not significantly, smaller plants than 2-oz. sets. The 2-oz. sets produced more plants than the 1-oz., yet more plants came from a given quantity of seed tubers cut into 1-oz. sets than into 2-oz. sets.

In regard to sprout production, close spacing in the row, 9 in. or less, was more advantageous in early than in late plantings. Seed in which different degrees of multiple sprouting were induced by treatment with thiourea gave similar results; as the number of sprouts per set increased more space was required by each hill to develop its tubers to marketable size.

The size of set studies and the spacing tests suggested as economical in planting, sets weighing about 1 oz. in hills 9 to 12 in. apart in the row.

New varieties of grain sorghum, H. H. FINNELL (*[Oklahoma] Panhandle Sta., Panhandle Bul. 22 (1930), pp. 3–8*).—The grain and stover yields in 3.5- and 7-ft. rows in 1927, 1928, and 1929 are reported on for Pink and Early Red kafir, Dwarf feterita, and Heileman, Smith, Beaver, and Double Dwarf milo, newer varieties not reported on in Oklahoma Station Bulletin 191 (E. S. R., 63, p. 229). Acre yields from 7-ft. rows were usually much less than from 3.5-ft. rows. Double Dwarf milo with 1,479 lbs. of grain, Heileman milo 1,251 lbs., and Beaver milo 1,204 lbs. led in average grain yields compared with 1,363 lbs. from Dwarf Yellow milo. Smith milo and Pink kafir with 1,934 and 1,733 lbs., respectively, led the newer sorts in stover production compared with 2,337 lbs. from Sunrise kafir and 1,920 lbs. from Dawn kafir.

Test effect of delayed harvest of wheat, C. P. WILSIE (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 87–89*).—American Banner wheat harvested July 5, 1930, in the soft dough stage yielded 46.5 bu. per acre and weighed 59.3 lbs. per bushel; July 8, medium dough, 48.1 bu., 60.5 lbs.; July 11, hard dough, 42.7 bu., 60.5 lbs.; July 18, dead ripe, 44.5 bu., 60.5 lbs.; and harvested July 25 when overripe yielded 38 bu. weighing 60 lbs. per bushel. The moisture content was high in the first two harvests, 30.8 per cent in the third, 12 in the fourth, and 10.6 per cent in the last. Field studies showed that in a dry season the delaying of harvest in order to combine wheat at a moisture content low enough for safe storage does not mean a lower test weight. Mois-

ture determinations made on samples collected at various hours during the day revealed a steady decrease in moisture from morning to late afternoon. The wheat was relatively low in moisture and, even over night, did not exceed a safe limit for storing, namely, 14 per cent. During a dry harvest season, as 1930, with the weather conditions which prevailed a combine could be operated for long days, probably from 8 a. m. to 7 p. m. or longer.

Results of seed tests for 1930, B. I. Glidden (*New Hampshire Sta. Bul. 252 (1930), pp. 17*).—Tables show the percentages of purity and germination for 375 official samples of field crops seed collected from dealers in New Hampshire during the year ended June 30, 1930.

HORTICULTURE

[**Horticultural investigations at the Alabama Station**] (*Alabama Sta. Rpt. 1929, pp. 27–30, 31, 32, 33, 34*).—As reported by C. L. Isbell and O. C. Medlock, hybrid pears, such as Kieffer, blighted nearly every season but not enough to prevent heavy production. The Pineapple pear proved entirely blight resistant but blossomed so early that in most years the flowers were killed. A seedling sand pear of later blooming habit and fair quality is now under test. The results of a variety test of grapes are presented in tabular form and show that certain of the newer hybrids yielded as well as or better than Concord and Niagara and possessed equally good quality.

Isbell reports that tung-oil nut trees, despite injury from low temperature, yielded a considerable crop in 1928. Results are presented of varietal tests with beans, cucumbers, kale, spinach, and turnips.

Cabbage fertilizer studies conducted by R. W. Taylor indicated the value of applying fertilizer before setting the plants. Cottonseed meal proved a better source of nitrogen than either nitrate of soda or ammonium sulfate. As the sole source of nitrogen, nitrate of soda was considerably more effective than ammonium sulfate. When used in complete mixture 750 lbs. of nitrate of soda was better than 500 lbs., 500 lbs. of superphosphate was better than 250 lbs., and 50 lbs. of potash was better than no potash. Larger amounts of each increased yields but slightly, if at all. According to Taylor, pecans responded liberally to nitrogen, 20 lbs. of nitrate of soda in the complete mixture being much more effective than 10 lbs.

As determined by W. D. Kimbrough, fertilizer had considerable effect on the vigor of strawberry plants, and, in the case of excessively vigorous plants, on the carrying quality of the resulting fruit. With plants of the same degree of vigor no difference was observed in the carrying quality of berries from nitrate of soda or cottonseed meal treatments. Heavy applications of muriate of potash did not improve the carrying quality of the berries. No apparent effect of fertilizer on the keeping quality of watermelons was seen by Kimbrough, and sugar and moisture content did not vary appreciably with fertilizer treatment. Nitrate of soda applied when the melons were half grown did not influence the quality, nor did applications of this material at any stage have any effect on the occurrence of white heart.

[**Horticultural investigations at the Oregon Station**] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 13, 14, 16, 18, 19, 68, 69, 70, 71, 102–109, 129, 130, 131, 132, 135, 136, 137, 138*).—Studies of mineral oil emulsions and their use indicated that the amount of oil adhering to the fruit throughout the growing season is a greater factor in calyx injury to light colored apples than is the concentration of unsaturated compounds in the oil. Commercial Bordeaux mixtures, with the exception of dusting materials, were found to compare very favorably with

homemade Bordeaux mixtures in the control of anthracnose. Work with commercial brands of lead arsenate showed no differences in composition that could account for differences in capacity to control codling moth, leading to the suggestion that variable results obtained by growers may have been due to factors other than composition. Certain combinations of organic solvents for oils and waxes with the hydrochloric acid in washing solutions gave promise of being highly effective in removing spray residues, more so than combinations of hydrochloric acid and inorganic salts. In tests fresh string beans which had been sprayed with arsenicals were cleaned far below the tolerance by washing in a 0.25 per cent solution of hydrochloric acid. No evidence was found in the case of apples and pears that lead, copper, or arsenate containing sprays influenced the soil composition in such a way as to increase the content of these substances in the fruit. Calyx injury in apples shown definitely to be an arsenical trouble was controlled by keeping the fruit dry after packing, timely picking, use of lime or Bordeaux mixture in the late sprays, prompt washing, and the use of lime in the rinse water.

A brief period of common storage between the picking and the marketing of fresh prunes caused a substantial improvement in quality, as judged by sugar and acids. The use of the flotation principle in the grading of fresh prunes was reflected in a much greater uniformity of the dried product. Studies of the chemical changes in stored pears incident to the rapid breakdown occurring after long storage gave no results.

An examination of pear soils in southern Oregon showed that adobe and clays, preferred by pear growers for certain varieties, are high in exchangeable calcium and that Bosc pears from such soil are also richer in calcium, suggesting the possibility that calcium is used advantageously by the fruit in making heavier and more resistant cell walls, supposed to consist largely of calcium pectate.

In studies upon rose-perfume production, satisfactory yields of perfume were obtained, and the petroleum ether method of extraction gave fair results, but the possibility of establishing a commercial industry was not proved. A fair percentage of hardwood blueberry cuttings set out early in moist peat rooted. The okra plant was found an excellent subject for the study of growth and reproduction relationships, growth showing a quick response to flowering processes.

In miscellaneous physiological studies it was found that light greatly influences the regeneration activity of cuttings. None of approximately 200 chemical treatments were effective in hastening the after ripening of *Rosa rubiginosa* seeds, suggesting a fundamental difference between dormancy in seeds and in buds. In certain dioecious plants the Manioloff reaction appeared capable of detecting sex in from 90 to 95 per cent of the cases.

Studies of various commercial fruit washers indicated that those using hydrochloric acid as a cleansing agent are generally satisfactory in respect to fruit injury. Attempts to use the flotation principle for determining the stage of maturity in cherries designed for fresh-fruit shipment were unsuccessful. Chemical studies of picked pears showed that starch is generally lost shortly after placement in storage at 32° F. Sugar content increased in cold storage, but gained most rapidly after removal to a warmer situation. Acetaldehyde accumulated in pears with the approach of breakdown. In the face of a loss in both weight and volume in storage water content remained quite constant throughout.

Yields of Marshall strawberries, loganberries, red raspberries, black raspberries, and Evergreen blackberries were increased 67.9, 88, 88.8, 57, and 144 per cent by irrigation in 1929. Both number and size of berries were increased.

Ettersburg 121 strawberries lost 9.3 per cent in yield under irrigation. The greater response of the blackberry is believed associated with late ripening, when nonirrigated plants began to suffer from lack of water. Irrigation enabled the summer planting of strawberry beds. Irrigation did not notably delay ripening but did prolong the bearing season of strawberries and had a beneficial effect on the quality of canned berries, except black raspberries, where the color shaded lighter under irrigation. Many thousands of strawberry seedlings were fruited, and one, O. S. C. No. 12, proved highly promising in several localities. Shallow cultivation of strawberries proved better than deep tillage. The removal of runners was found advisable in respect to the succeeding crop.

Among greenhouse tomatoes tested, the English varieties Best of All and Princess of Wales and the American Crackerjack proved best. Studies on the color of beets showed a wide variation in the percentage of well colored roots in different strains. Irrigation apparently increased the percentage of desirably colored roots in any given varieties. Notes are made on the color of carrot roots. Irrigation increased total yields of sweet corn by 140 per cent and the weight of ears by 70 per cent. Irrigation increases for snap beans, late cabbage, and peppers were 74, 45, and 98 per cent, respectively. Deducting added costs, irrigation proved profitable for corn, squash, beans, and eggplant.

In fruit production studies further tests were made with added success of the flotation system of grading fresh and dried prunes, and it was found possible to separate fruits according to maturity as well as weight. A satisfactory bleaching method was developed for maraschino cherries. Results in the preservation of berries by freezing indicated that the present carton is too absorptive, that sirup holds fruit better after defrosting than does dry sugar, that shrinkage and discoloration is less with sirup, and that the retarding action of the carton has some effect upon improving the quality of the product by permitting longer osmotic action before actual freezing. This delay freezing also permits a better interchange of sugar with juices, which te to toughen the berry to better withstand the defrosting.

Studies at the Hood River Substation failed to show any significant res from the use of fertilizer in a closely planted Anjou pear orchard. Phospho was found to improve cover crop growth above that obtained with nitro alone. Nitrogen promoted tree growth. Determinations of the green weight sweetclover tops and of roots to a depth of 2 ft. gave 37,647 and 12,161 per acre, respectively; the average number of plants per square yard was No significant difference was noted between nitrate of soda, ammonium sulf sheep manure, and complete fertilizer for Yellow Newtown apples, and the tilizers failed to overcome alternate fruiting. There was a moderate g of fertilizers over no treatment. Sheep manure as an adjunct to chemi fertilizers gave good results with the Clark Seedling strawberry. In studies with Yellow Newtown apples heavy annual pruning resulted in increased terminal growth but decreased fruiting area. Numerous strawberries were tested to discover a better variety than Clark Seedling. Various new apples and pears, including red sports, were tested.

At the Southern Oregon Substation tests of various pear species as rootstocks showed that *Pyrus ussuriensis* and *P. serotina* are not well adapted to local heavy and shallow type soils but that they do grow excellent trees on deep, well drained soils. *P. calleryana* and *P. betulaefolia*, on the other hand, showed much promise, and vigorous and desirable strains of these and of *P. communis* were isolated and propagated. In cooperation with the main station the pressure tester was established as the most reliable index to picking maturity of pears. The storage life of the pear was found to be closely related

to the stage of ripening at picking. Certain pear varieties were found to have definite soil preferences, the Bosc developing best quality on heavy upland adobes, the Comice on lighter types of soil, and the Winter Nelis preferring very fertile soils. Bartlett, Howell, and Fall Butter proved to be good pollinizers for Anjou. In propagation studies success was had with pieces of root taken from pear trees less than 6 years old. The Youngberry proved highly promising.

[**Horticulture at the Porto Rico Station**], D. W. MAY, T. B. MCCLELLAND, R. L. DAVIS, and H. C. HENRICKSEN (*Porto Rico Sta. Rpt. 1929, pp. 8–11, 14, 15, 16–19, 21, 23, fig. 1*).—Notes presented on the results of tests of the seed producing capacity of a large number of garden flowers showed that many species produce abundant seeds under Porto Rico conditions. Tests of beach sand, fine river gravel, charcoal, and potting soil as media for rooting cuttings showed gravel to be the best. A saturated solution of air-slaked lime was found valuable in inducing rooting of certain cuttings, particularly sugarcane. Nitrogen, phosphorus, and potash in various combinations hindered the rooting of cuttings, whereas bottom heat favored rooting in all cases. Use of colored lights indicated that normal light is best in the propagation of cuttings.

The leguminous trees *Erythrina corallodendron* and *Gliricidia sepium* were found valuable as interplants for citrus. Grapefruit grown in shade had better flavor and a smoother but lighter colored skin than did fruit grown in the full sun. Growth was more rapid in shade, but fewer branches were produced.

Notes are presented on the behavior of various fruit and ornamental trees following the 1928 hurricane. In the Las Vegas coffee fertilizer experiment trees were injured, but evidence was obtained that fertilizer had been highly beneficial, the lowest yield from any fertilized plat being twice that of the control. The value of potash was shown in increased yield of a plat originally receiving nitrogen alone but changed over to a complete fertilizer high in potash. Of shade trees for coffee *E. berteroana* and *G. sepium* quickly recovered from hurricane injury.

A considerable number of varieties of Temperate Zone garden beans were tested in comparison with native varieties, and certain kinds, including Fordhook Favorite, Burpee Stringless Green Pod, Full Measure, Hodson Wax, White Creaseback, and Kentucky Wonder, did very well. In sweet corn breeding with inbred lines of Mayaguez 1 germination results indicated that certain of the recombinations had more vigor than the parent. Seeds were obtained from the natural crossing of pineapple varieties planted in 1928 for breeding purposes.

[**Horticultural investigations at the Tennessee Station**], J. A. MCCLINTOCK (*Tennessee Sta. Rpt. 1929, pp. 37–39, 40, 44–46, 47, 48, 50, 51, 52*).—Shipping tests of strawberries in the 1929 season showed that certain of the new Aroma seedlings hold up better than Aroma itself and compare very favorably with Klondyke. One seedling in particular was found valuable because of its upright habit of fruiting and retention of berry size through the picking season. No new blackberry was found that equaled Early Harvest in production of early fruit. The Van Fleet continued to lead other raspberries in respect to vigor and yield but was hybridized with better quality varieties to secure other desirable qualities. The Lucretia dewberry outyielded the Young and Oregon Evergreen varieties. Several thousand rhubarb seedlings were grown in an effort to develop crown rot resistant varieties. Among tomatoes, those of the Baltimore type proved most productive, with Marglobe desirable on wilt infested soils. Working with the Giant Stringless Greenpod bean, it was noted that seed which germinated best in the laboratory gave the best results in the field.

Off types ranging from 5 to 15 per cent were found in strains of the Alaska pea. Promising results were obtained in the growing of pyrethrum.

Observations at the West Tennessee Substation on fire blight infection of young Yellow Transparent apple trees indicated that primary infection is largely through the blossoms and that old infected pear trees are an important source of the disease; also a small percentage of cankers on apple trees overwintered the disease. Notes are presented on tests with various trees and small fruits. Stock varieties of apple, cherry, plum, and quince originally obtained from Europe produced seed excelling in viability that secured directly from abroad.

The Tennessee Beauty tomato was found productive and wilt resistant. Tomatoes raised on different fertilizer plats and shipped to distant markets were found to vary but little in shipping quality, and heavy applications of nitrate of soda had no harmful effects. The Marglobe proved promising on wilt infected soils. Home-grown cabbage plants proved superior to imported stock.

At the Middle Tennessee Substation the Star apple was found so susceptible to blight as to render it unworthy of planting. Budding proved better than grafting for top-working young trees.

Records taken at the Mericourt Substation upon the yields of sweet corn on fertilized plats showed that ground limestone, muriate of potash, and nitrate of soda increased yields beyond those secured with superphosphate alone. Nitrate of soda also increased the growth of young apple trees. Glass did not prove enough better than cloth to justify its use in tomato plant production. Transplanting tomatoes in the beds was not found economically justifiable. Staking increased the yield of No. 1 grade tomatoes. Western-grown bean seed proved freer of disease than eastern seed and gave cleaner crops. The Van Fleet raspberry outyielded common red varieties but did not possess comparable resistance to winter exposure. The Early Harvest blackberry produced early crops, coming in ahead of the wild berries.

Fertilizer work with cabbage, L. M. Ware (*Mississippi Sta. Circ. 91 (1930), pp. 4*).—Two years' results of fertilizer experiments with the Charleston Wakefield cabbage grown in tripartite plats with lettuce and spinach suggested the value of a complete fertilizer for cabbage on the soil utilized. Nitrogen was the only element which used alone increased yields. The use of either phosphorus or potash alone, in addition to nitrogen, did not significantly increase yields above those obtained with nitrogen. The largest increase in value and the largest net increase in profit were secured from the application on the acre basis of 532 lbs. of nitrate of soda, 1,250 lbs. of superphosphate, and 160 lbs. of muriate of potash. The effect of seasons was shown in yields of from 7 to 8 tons more per acre in 1930 than in 1929.

Hydration in sweet corn, A. L. Bakke and A. T. Erwin (*Iowa State Col. Jour. Sci., 5 (1930), No. 1, pp. 5–14, figs. 5*).—In studies at the Iowa Experiment Station the authors found that cured Stowell Evergreen sweet corn kernels when placed in distilled water increased in weight 113.37 per cent as compared with 73.7 per cent for dent corn. The rate of absorption was greater in the sweet corn, which in 15 hours gained 50 per cent as compared with 28 hours for a similar gain in dent corn. In an atmosphere of 100 per cent saturation the maximum hygroscopicity of sweet corn was 50.56 and of dent corn 45.68. At 90 per cent of saturation the respective values were 30.06 and 28.79 per cent. The hydration capacity of cured sweet corn was 32.42 per cent in the milk stage, 42.38 per cent in the early dent, and 44.45 per cent when harvested mature, as compared with 31.60, 41.23, and 43.33 per cent, respectively, for dent corn.

Studies on tree root activities, Part III, G. H. HARRIS (*Sci. Agr., 11 (1930), No. 4, pp. 191–199, figs. 2*).—Continuing a series of papers (E. S. R., 63, p. 736)' the author reports that top pruning caused a decrease in root respiration of trees which had already started top activity, whereas in trees with no apparent top activity pruning increased root respiration. Root respiration was decreased following injections of glucose and increased in chlorotic trees by light injections of iron tartrate sufficient to cause greening of the foliage. Severing the tops from the roots caused an immediate acceleration in root respiration of vigorous trees, followed by a gradual decrease to a low level. Similar treatment of less vigorous trees caused no initial change, followed by a continued decline. After the initial rise root respiration decreased gradually in some trees but continued to increase in others.

Cutting off the light supply to the growing top reduced the amount of root respiration. Ringing increased root respiration and stimulated shoot growth. Under conditions of high transpiration the carbon dioxide excreted by the roots was lower than under conditions of low transpiration, it being conjectured that some of the carbon dioxide produced during root respiration is carried up to the tops during a time of high transpiration. Little relation was noted between the amount of carbon dioxide excreted by the roots and absorption in the nutrient solution, the components of which were readily available. Absorption, on the other hand, seemed to be more closely correlated with top activity.

Observations on winter injury to fruit trees, F. P. ESHBAUGH (*[Oklahoma] Panhandle Sta., Panhandle Bul. 22 (1930), pp. 12–14, fig. 1*).—A popular article discussing briefly various factors, such as late growth, soil moisture conditions, cover crops, etc., that bear on the winter injury problem and also ways and means of preventing rabbit and mouse injury.

Acidity changes associated with the keeping quality of apples under various storage conditions, H. H. PLAGGE and G. GERHARDT (*Iowa Sta. Research Bul. 131 (1930), pp. 341–358, figs. 3*).—Determinations of the specific gravity, H-ion concentration, and total titrable acidity changes in Jonathan and Grimes apples harvested during the commercial season but subjected to different handling and storage treatments showed distinctive varietal characteristics. The juice of Grimes apples increased definitely in specific gravity during the interim between picking and storage, whereas that of the Jonathan maintained a very uniform constant, quite irrespective of the length of the interim. Total acidity values declined rapidly, but H-ion concentration remained quite uniform in Grimes apples during a two weeks' delay before storage. When this prestorage period was increased to three weeks there was noted a rather abrupt lowering of active acidity of the fruit in cold storage. Total acidity decreased more in Grimes during delayed storage than during the entire subsequent cold storage period.

The onset of soggy breakdown in stored apples almost coincided with a rather marked diminution in H-ion concentration and suggested to the authors the possibility of an intimate balance between active acidity and carbohydrate content in Grimes apples held at low temperatures. In the Jonathan there was apparently an inverse relationship between the percentage of total acid loss during storage and susceptibility to Jonathan spot. In both varieties higher temperatures accelerated the diminution in total acidity, the two factors concerned in acid loss in storage being initial acid content and temperature; hence the desirability of storing fruit promptly after picking and at a temperature sufficiently low to slow down changes.

Oriental pear stocks tested in Michigan, S. JOHNSTON (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 67, 68, figs. 2*).—Tests at the South Haven Substation of various pear species as stocks indicated that oriental pears may not prove satisfactory as rootstocks for Michigan. Pears on *Pyrus calleryana* showed great variation in growth, with evidence that this species is not highly winter resistant. Because of great variability *P. ussuriensis* is also not deemed valuable. Although trees on *P. serotina* made good unions and good growth, the value of this species is considered dubious. The common pear *P. communis* is believed to furnish the most desirable rootstocks for Michigan.

FORESTRY

A textbook of forest protection, C. WAGNER (*Lehrbuch des Forstschutzes. Berlin: Paul Parey, 1930, pp. VIII+357, figs. 20*).—The hazards and means of prevention against such troubles as frost, storms, forest fires, and insect and fungus pests are discussed in detail.

Forest and range resources of Utah: Their protection and use (*U. S. Dept. Agr., Misc. Pub. 90 (1930), pp. 102, figs. 53*).—A general discussion of such items as land uses and control, use and management of forage resources, use and management of timber resources, water resources and their protection, water supply and its use, management of wild life and recreation facilities, fire protection, etc.

Forest types of the northern Rocky Mountains and their climatic controls, J. A. LARSEN (*Ecology, 11 (1930), No. 4, pp. 631–672, figs. 13*).—Descriptions are presented of the natural forest types of the northern Rocky Mountains in Montana and Idaho, pointing out their distribution and chief silvicultural and ground cover characteristics. The relation of topography, rainfall, etc., to the character of the forests is discussed.

Ohio Forest News, [November, 1930] (*Ohio Forest News [Ohio Sta.], No. 11 (1930), pp. 8*).—Notes are presented on the soil and climatic requirements, the value of the wood, planting methods, etc., for several species of deciduous and coniferous trees adapted to various locations in Ohio.

A handbook upon conifer growing, edited by J. FITSCHEN (*Handbuch der Nadelholzkunde. Berlin: Paul Parey, 1930, 3. ed., rev., pp. XV+765, figs. 204*).—A completely revised third edition of a work previously noted (E. S. R., 21, p. 338).

Conifers vary in rapidity of growth, R. H. WESTVELD (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 57, 58*).—Observations in a series of plantings established in 1914 on a sandy slope showed that western yellow pine, eastern white pine, and Norway spruce have specific requirements. On the top of the slope the Norway spruce thrived poorly, whereas the western yellow pine suffered the least. Records showed for the western yellow pine, eastern white pine, and Norway spruce height growths of 21.7, 23.3 and 21.8 ft. on the lower slope and 18.7, 19.6, and 11.1 on the upper slope. Diameters at breast height for the species grouped in the same order were 4.4, 4.0, and 3.0 in. on the lower slope and 4.1, 3.4, and 2.1 in. on the upper slope. The western yellow pine had already begun to crowd, indicating that the different species had individual spacing requirements.

The Ozark white cedar, J. T. BUCHHOLZ (*Bot Gaz., 90 (1930), No. 3, pp. 326–332, figs. 2*).—A botanical description is presented of a new species of cedar designated as *Juniperus ashei*.

The yield of Douglas fir in the Pacific Northwest, R. E. MCARDLE and W. H. MEYER (*U. S. Dept. Agr., Tech. Bul. 201 (1930), pp. 64, pls. 8, figs. 17*).—Based on

data obtained from sample plats laid out in a great number of representative young forests and supplemented by periodic remeasurement of a number of permanent plats, growth, yield, increment, stand, and volume tables are presented for Douglas fir. Preceding the tables there is a discussion of the forestry situation in the Douglas fir region, including comments on the growth characteristics of the forest and of the tree, relation of site quality to yields, degree of stocking, etc. A short appendix presents certain of the basic data and a discussion of the technic employed in preparing the yield tables.

The determination of increment in cut-over stands of western yellow pine in the Southwest, H. Krauch (*Jour. Forestry, 28 (1930), No. 7, pp. 978–986, figs. 5*).—Because of the fact that irregular stocking, uneven aged character, and lack of uniformity in size and age classes in western yellow pine stands in the Southwest made growth determinations from sample plats unreliable, the author presents a method based on the stand rather than the area. He suggests that the data should be collected on long, narrow strips and on periodic remeasurement of only a definite number of trees of each diameter class.

The effect of after-ripening treatment on the germination of eastern hemlock seed, H. I. Baldwin (*Jour. Forestry, 28 (1930), No. 6, pp. 853–857, figs. 2*).—Obtaining very low germination of fresh eastern hemlock seeds sown in January, despite the fact that cutting tests showed the seed to be very good, further experiments were carried out in which the seed was stratified in moist peat at 10° C. (50° F.) for 1 month, with the result that germination was increased as much as 45 per cent in 40 days in the Jacobsen apparatus at 10 cm. (4 in.) water level. Stratification for 45 days gave a maximum increase of 59 per cent after 70 days in soil. Both germinative energy and final germination percentage were increased by stratification. Dry, untreated seed germinated better with increased moisture.

Acorn storage in the Southern States, C. F. Korstian (*Jour. Forestry, 28 (1930), No. 6, pp. 858–863*).—Of three methods of storing acorns tested by the Appalachian Forest Experiment Station, namely, stratification 3 ft. below ground level, in running water, and in moist sand held at controlled temperatures of from 33 to 40° F., the third method was the most successful. Of the three oaks, white, chestnut, and scarlet, only the scarlet was able to survive in the running water, giving 69 per cent germination in this case as compared with 85.7 per cent for the soil lot and 90.7 per cent for the cold storage test. The author concludes that the best storage method for acorns is one which will keep the acorns moist at a temperature low enough to prevent appreciable growth of the radicle.

Aspen association in northern Lower Michigan, F. C. Gates (*Bot. Gaz., 90 (1930), No. 3, pp. 233–259, figs. 14*).—The aspen association, although secondary, is extensively developed in the northern part of the lower peninsula of Michigan, following consistently the burning over of various other associations. On sandy upland soils the aspen association is dominated by *Populus grandidentata*, on clayey upland soils by *Prunus pennsylvanica*, and on lowlands by *Populus tremuloides*. With occasional fires the association may be perpetuated indefinitely, but without fire is generally succeeded by a more suitable forest association. A table is included showing the frequency index of the more important ground plants in the aspen associations.

Sweet gum in Maryland, F. B. Trenk (*Baltimore: Md. State Dept. Forestry, 1929, pp. 75, figs. 16*).—A handbook of general information on distribution, culture, uses, potential yields in plantations, etc.

DISEASES OF PLANTS

[Botany and plant pathology at the Alabama Station] (*Alabama Sta. Rpt. 1929, pp. 22, 23*).—Studies by W. A. Gardner showed that although acids decompose chlorophyll there is a definite enzyme which hastens the yellowing process in the rinds of Satsuma oranges. With the same or a slightly higher H-ion concentration in the unboiled than in the boiled juice, chlorophyll decomposition was more rapid in the former. Attempts to precipitate the active enzyme by means of alcohol were unsuccessful. The enzyme was less abundant in the green than in the yellow rind of the Satsuma orange, and more abundant in the rind of the California than of the Satsuma orange.

In observing the resistance of different varieties of sweetpotatoes to inoculations with black rot, Gardner noted no resistance in Dooley, Jersey Sweet, and 5 other varieties; from 1 to 4 per cent of resistant plants in 19 other varieties; and more than 6 per cent in the Nancy Hall and 2 other varieties.

In dusting experiments with the Pabst and Success pecans, it was found by R. W. Taylor that 5 applications at 3-week intervals of 80–20 hydrated lime-monohydrated copper sulfate dust increased the crop on the basis of the whole nut by 22 and 22.8 per cent for the 2 varieties, respectively, with increases of 31.7 and 34.9 per cent on the basis of the shelled meat.

[Plant pathology at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 15, 16, 17, 18, 71, 78–82, 128, 129, 135, 136, 137*).—Experiments conducted in cooperation with the U. S. Department of Agriculture proved that Jimson weed, black nightshade, wild bittersweet, tomato, and pepper may harbor the virus of potato leaf roll, while black nightshade and tomato may carry the rugose mosaic of the potato.

Investigations conducted in the Hood River Valley showed that the woolly aphis is the sole agent concerned in the transmission of perennial apple canker, and complete control of the insect was obtained by adding nicotine sulfate to various wound applications.

Tests of 843 varieties of vegetables and other plants for resistance to curly top revealed one variety of bean and one of squash of considerable resistance.

Inoculation tests with a large number of smuts on various wheats showed that there are at least six distinct physiological forms of smut, each reacting in a different manner on the wheats tested.

Rapid methods of disinfecting the surfaces of fresh prunes and cherries were developed. Under laboratory tests the decay in cherries was thus reduced from 66 to 17 per cent. In common storage for from 5 to 6 days the loss was reduced from 51 to 12 per cent.

Two parasitic fungi, the yellow rust and the cane blight organism, were found to be jointly responsible for the basal canker of the red raspberry.

Properly timed sprays were found effective in reducing walnut blight. In one grove in 1929 a single application of Bordeaux mixture reduced blight from 40 to 8 per cent. In another grove 12 per cent loss was reduced to 0.5 per cent by two applications.

Some suggestion was secured that little leaf of the apple and pear may be associated with the presence of strata of free limestone in the soil.

In experiments conducted in cooperation with the U. S. Department of Agriculture, it was found that narcissus mosaic may be transmitted by a simple leaf-mutilation method.

In respect to "breaking" of tulips, it was noted that tulips of all primary color types are susceptible to this disease, and it was established that "break-

ing" follows some definite law rather than being a simple matter of color rearrangement.

Iris mosaic was found to be transmitted by several different aphids, and almost any type of mechanical means of inoculation was successful.

Inconclusive results were obtained in attempts to control tulip fire.

In Verticillium wilt studies the three leading Oregon black raspberries—Munger, Plum Farmer, and Cumberland—were found susceptible, and, in fact, no resistant variety was located. All inoculated plants were dwarfed and matured but little desirable fruit. Some instances were seen of total recovery of affected plants. Uninoculated plants located 9 ft. from inoculated plants did not show wilt until the third year and then only 2 per cent were affected.

Tuber-unit roguing of potatoes was more effective than the so-called mass roguing for controlling virus diseases. *Myzus persicae*, *M. pelargoni*, and *M. circumflexus* were found capable of transmitting leaf roll, whereas the common aphid, *Illinoia solanifolii*, rarely carried the disease. Attempts to transmit other virus diseases by these aphids proved ineffective. Crinkle mosaic and spindle tuber under certain conditions reduced yields from 40 to 60 per cent. Rugose mosaic was transferred from the potato to the tomato and black nightshade by artificial inoculation.

Of various chemicals and proprietary mixtures tested as disinfectants for fresh fruit, formaldehyde in dilute solutions, used as a dip, impregnated in paper placed in the bottoms and tops of boxes at the time of packing, or as a dust mixed with diatomaceous earth, gave good results for sweet cherries and caused no harmful effects on flavor, odor, or color. Light-colored cherries required a weaker concentration than did dark-colored cherries.

Four factors concerned in root injury of strawberries in Oregon were Armillaria root rot, high water table and adverse soil conditions, winter injury, and Rhizoctonia. Rhizoctonia was confined mostly to sandy loam hill lands, especially new soils, and the Armillaria root rot was always found on newly cleared soil or where orchards or shrubby plants had been grown.

Bacterial blight of filberts were found to be due to a single type of organism which closely resembled that causing walnut blight.

Curly top of vegetables was found to behave differently in various species. Certain susceptible varieties succumbed so slowly that they produced more of a crop than did rapidly succumbing varieties.

A fungus repeatedly isolated from cherry buds that had died in the winter caused a rot of the apple which could not be distinguished from that produced by the perennial canker and anthracnose fungi.

European brown rot (*Sclerotinia cinerea pruni*) was found to be the principal cause of blossom blight of the cherry, although *S. fructicola* caused occasional injury. Bordeaux mixture applied when the petals showed white was the best protection.

Coryneum blight, generally confined to the peach, was observed on cherries and on prunes.

The chief organism isolated from wheat plants affected with the northwestern foot-rot disease was found pathogenic and to have a conidial stage similar to *Cercosporella herpotrichoides*.

In studies at the Hood River Substation of different methods of controlling scab of the pear and apple, varieties were found to differ widely in their susceptibility to spray injury, the Anjou pear being easily affected, even by supposedly harmless combinations such as dry-mix sulfur and arsenate of lead.

Observations on winter-injured pear trees indicated that trees on *Pyrus communis* roots suffered less than did those on *P. serotina*. Pear trees from

6 to 7 years old were more resistant to winter injury than were younger trees. The complete killing of trunks, involving complete girdling of the cambium, was 6.1 and 28.6 per cent, respectively, for 9 varieties worked on *P. communis* and *P. serotina* roots. No significant differences in winter injury were noted between 7-year-old Anjou, Bosc, and Bartlett pears growing in alfalfa or those intercropped with strawberries. Whitewashing and shading with boards greatly reduced the percentage of winter-injured trees. Differences were noted in the adhesiveness of various brands of whitewash. Spraying of the materials on the trunks proved feasible.

Pear blight studies at the Southern Oregon Substation indicated that diseased roots are the source of much hold-over blight and that the promising way of overcoming this difficulty is the use of resistant rootstocks.

Inoculations of thousands of seedlings of five different species showed some highly resistant individuals in each species. Some of these were found to transmit a high degree of resistance to progeny obtained from seed. The Old Home variety of *P. communis* proved a desirable intermediate stock for forming the trunks but was susceptible to canker, which yielded, however, to two sprayings with Bordeaux mixture. Variolosa was another promising trunk-forming stock.

Applications of Bordeaux mixture were found sufficiently valuable in reducing blight infections during the blossoming period, and the practice was adopted by several commercial growers.

Report of the plant pathologist, C. M. Tucker (*Porto Rico Sta. Rpt. 1929, pp. 24, 25*).—Comparisons of cultures of fusaria isolated from diseased sugarcane in Java, Porto Rico, and Cuba with two authentic cultures of *Fusarium moniliforme* isolated from corn roots in Missouri and from cotton roots in Georgia failed to confirm their identity. Moniliform microconidia were repeatedly produced by the *F. moniliforme* cultures but always in capitate clusters in the sugarcane cultures. Considerable differences in growth and color were noted in the three sugarcane cultures but scarcely more than were shown by separate cultures of any one of the three.

Consistent failure to isolate organisms from chlorotic blotches that showed no reddish or brownish spots or streaks and failure to produce such blotches suggested that these are not the earliest symptom of Fusarium infection. The chlorotic blotches were found to occur very commonly on many varieties of sugarcane, but search for Fusarium infection in the central cylinder of such canes was fruitless. It is believed that the chlorotic blotches should be distinguished from pokkah boeng.

Fusaria isolated in Porto Rico, Cuba, and Java were similar in pathogenicity on P. O. J. 2878. Inoculations of unwounded canes rarely resulted in leaf infection, and no cases of top rot resulted. Injection of a suspension of spores and hyphae into the leaf spindle resulted in infection of the developing leaves and growing point, and injections into the growing point resulted in its death and top rot. Isolations from top rot following stalk-borer attacks yielded Fusarium strains that were indistinguishable from those isolated from the leaf infections and suggest the presence of the fungus as a common saprophyte in cane fields. Chlorotic blotch had no apparent effect on photosynthetic activity, and there was no splitting or collapsing of the leaf. Apparently the Fusarium concerned is a weak parasite and more virulent on chlorotic than normal green tissue. It is believed that pokkah boeng is unlikely to become an important factor in the cultivation of P. O. J. and hybrid canes of Java parentage.

Soil inoculations of avocado seedlings with *Phytophthora cinnamomi* caused a severe root disease and ultimate death.

The snapdragon was found to harbor *P. palmivora*, the plants wilting and dying following the decay of the roots.

[**Plant pathology at the Tennessee Station**] (*Tennessee Sta. Rpt. 1929, pp. 20–22, 35–37, 39, 40–42*).—Observations by S. H. Essary on several varieties and selections of tomatoes showed no marked resistance to leaf spot, although some differences in susceptibility were apparent. Although spraying with Bordeaux mixture controlled leaf spot, yields were reduced by spraying, apparently as a result of the dropping of young fruits. In another experiment, where only three sprays were used, one in the plant bed, one shortly after the plants were set out, and one 10 days later, the yields of the sprayed plants were larger than those of the unsprayed.

Among the pears tested by J. A. McClintock for fire blight resistance, two varieties displayed marked resistance, but both were of inferior quality. Breeding operations intending to combine disease resistance of the Oriental with the quality of the European and American pears were conducted and yielded many seedlings.

Pyrus calleryana and *P. betulaefolia* showed resistance to blight and also marked resistance to leaf spot, which practically defoliated varieties of *P. serotina*, *P. ussuriensis*, and *P. communis* by midsummer. Blight organisms were found to winter over largely in pear cankers, from which primary spread is believed to be the result of rains. Experiments with apple rootstocks indicated that some species are more resistant than French crab to fire blight.

In studies of nematode-resistant rootstocks for the peach, McClintock found that peaches could not survive on Marianna plum roots unless peach roots appeared from above the union.

The growing of lettuce or other quick-growing susceptible plants proved a practical index to the presence of nematodes in nursery soils. Flood waters spread nematodes.

None of the common rose stocks were found immune to root knot.

American-grown Mahaleb and Mazzard cherry pits germinated better than imported pits and produced equally good stocks the first year from seed. Virginia-grown Mazzard seed proved very satisfactory, being equally vigorous and more resistant to leaf spot than French Mazzard.

Mummy peaches proved the most important source of brown rot infection, and it is believed that brown rot limb cankers do not overwinter this disease. Under favorable conditions mummy peaches on the ground produce apothecia and perfect spores of brown rot.

As reported by C. D. Sherbakoff, individual plant selections were made from wheat collected over the State with a view to finding scab and root rot resistant strains. Previous selections compared favorably with the best standard wheats and gave promise of yielding new strains of high resistance, high yield, and fine quality.

From studies of cotton wilt, Sherbakoff concludes that the use of proper fertilizers containing sufficient potash and the rotation of crops should reduce losses. On light soil, in which the disease has become well established, the use of resistant varieties is deemed the only safe method of control.

Soil acidity appeared to be a factor in the development of crown gall in apple trees, high acidity lessening the disease.

Evidence was secured that systematic thorough spraying will control apple black rot and scab even in epidemic years.

Of 62 varieties of cotton tested for resistance to Verticillium wilt, Sea Island and Pima alone appeared practically immune. All the short-staple varieties seemed susceptible.

Seed treatment reduces loss from plant diseases, F. C. Meier (*U. S. Dept. Agr., Misc. Pub. 94 (1930), folder*).—Brief instructions are presented in this leaflet for the preplanting treatment of various seeds, tubers, and bulbs for the control of seed-borne diseases.

Investigations on the fungicidal action of sulphur.—Progress report, B. T. P. Barker (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1927, pp. 72–80*).—Continuing this series (E. S. R., 45, p. 143), this report deals more particularly with the movement of sulfur through space in a way corresponding to the known behavior of gold and of arsenic.

"Sulfur is dispersed through space from any of the ordinary forms of the solid substance, such as flowers of sulfur, precipitated sulfur, roll sulfur, etc., in the form of minute solid particles, which under appropriate conditions appear to emanate from the parent mass continuously. Moisture and a high temperature particularly appear to favor the discharge." The size of the dispersed particles is as yet unknown, since they are probably invisible. On the slide a tendency to aggregate is observable, and possibly the finest particles observed are in reality aggregates of a still smaller original form. Movement of sulfur in any other form than this "particulate" state has not been demonstrated, and it is not known to pass at ordinary temperatures as a gas or as a vapor. Critical tests are indicated as showing that in a greenhouse or in the open air the discharged particles can be carried some distance. The protective action of sulfur coated on hot pipes or given off from moistened dishes in a greenhouse is accounted for on this basis. The nature of the discharge and the force of dispersion have not yet been closely investigated; but in a sealed vertical glass tube 5 ft. long and 3 in. in diameter, kept in a laboratory of even temperature, moistened sulfur placed in the lower end uniformly coated a vertically hanging chain in a few weeks.

The interaction between sulfur and the living plant was studied along two main lines, contemplating action between host and fungicide and between fungus and fungicide, and some of this work is detailed as done with the strawberry, as also with members of the widely separated groups Gramineae, Rosaceae, and Ribesiaceae.

It is shown that when under certain conditions sulfur is dusted onto actively growing leaves of plants, the reaction produced gives off H_2S in gaseous form, the toxicity of which to fungi was brought under investigation.

***Investigations on the fungicidal action of sulphur.*—III, Studies on the toxicity of sulphuretted hydrogen and on the interaction of sulphur with fungi, R. W. Marsh** (*Jour. Pomol. and Hort. Sci., 7 (1929), No. 4, pp. 237–250, pls. 2*).—In pursuance of the statements made in the second paper of this series, noted above, the present author reports that the high toxicity of H_2S to germinating spores of several fungi has been demonstrated by quantitative experiments. A possibility is apparent of discriminating between the activity of the flowering plant and that of the fungus.

Spores kept under the gases from sulfured leaves of strawberry and other plants have been markedly inhibited as regards germination.

Results given indicate that the sensitivity of certain spores to sulfur is an indication of the capability of such spores, on germination, to interact with sulfur so as to produce hydrogen sulfide.

Investigations on the fungicidal action of sulphur.—III, The toxicity of sulphuretted hydrogen and the interaction of sulphur with fungi, R. W. Marsh (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1928, pp. 106–108*).—This is indicated as a summarized version of the paper above noted.

Diseases of cover crops, A. K. BRIANT and E. B. MARTYN (*Trop. Agr.*, [*Trinidad*], *6* (*1929*), *No. 9*, *pp. 258–260*).—Observations made in the season 1927–28 under the direction of H. R. Briton-Jones are outlined, with a summary of the diseases recorded, together with some details of experimental work done on diseases attacking sunn hemp (*Crotalaria juncea*). The latter diseases include a Fusarium (*F. vasinfectum*) wilt, a Colletotrichum (*C. curvatum* n. sp.) anthracnose, and a Cercospora leaf spot; in case of sword bean (*Canavalia ensiformis*) a soil deficiency disease and a Sclerotium disease (*S. rolfsii*); cowpea (*Vigna catjang*) mosaic, Cercospora leaf spot (*C. cruenta*), and powdery mildew (*Oidium* sp.); pigeon pea (*Cajanus indicus*) rust (*Uromyces dolicholi*) and stem canker (a fungus present); and Bengal bean (*Stizolobium aterrimum*) seedling disease (*Corticium vagum*) and Cercocent; and control 18.11, 10, and 17 per cent.

Report on bunt prevention trials, 1927, R. M. NATTRASS (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1927, pp. 104–106*).—For trials carried out at three points on wheat bunt prevention, each series representing part of a commercially grown field of wheat, the results are tabulated. The counts of bunted heads, corresponding in these trials to the several treatments in the three fields, stood as follows: Copper sulfate 0.19, 0, and 0.15 per cent; copper carbonate 0.42, 0.09, and 0.73 per cent; formalin 0, 0, and 0.76 per cent; and control 18.11, 10, and 17 per cent.

Preliminary notes on yellow spot disease of wheat caused by Helminthosporium tritici-vulgaris Nisikado, Y. NISIKADO (*Ann. Phytopath. Soc. Japan, 2* (*1928*), *No. 2, pp. 89–98, pls. 2; Eng. trans. in Ber. Ōhara Inst. Landw. Forsch., 4* (*1929*), *No. 1, pp. 103–109, pls. 2*).—The two Helminthosporiums causing disease in wheat that have been known in Japan for some years include the leaf spot caused by *H. sativum*, said to attack both aerial and subterranean parts, and another species causing yellow spots of characteristic shape on wheat leaves, which the author has described (as found at Kurashiki, Prefecture of Okayama) as the new species *H. tritici-vulgaris*.

Bean fusariosis [trans. title], M. BENLLOCH and J. DEL CAÑIZO (*Bol. Inst. Nac. Invest. y Exper. Agron. y Forest.* [*Madrid*], *1* [*1928*], *No. 1, pp. 140–146, figs. 5*).—A bean disease is noted as to symptoms, favoring cultural conditions, causal fungus (*Fusarium martii phaseoli?*), varietal resistance, and control measures, including primarily the burning of diseased material.

The control of celery blights, J. D. WILSON and A. G. NEWHALL (*Ohio Sta. Bul. 461* (*1930*), *pp. 30, figs. 5*).—Stating that celery in Ohio is subject to three leaf blights arranged in order of importance as late blight (*Septoria apii*), early blight (*Cercospora apii*), and bacterial blight (*Bacterium apii*), the nature, distribution, symptoms, and control of each disease are discussed. Of the three diseases, late blight alone consistently caused severe crop losses. All three organisms were found to winter over in the soil in diseased celery refuse, making rotations desirable. Long periods of rainy weather favored all three blights and largely determined the severity of the outbreaks. Foliage on the north side of celery rows was often more severely attacked by late blight.

Seed treatment and the use of seed two or more years old were helpful if sowings were made on disease-free soil. Dusts or sprays applied to the seed bed were highly important in producing clean plants for the field. Crowding in the seed bed was harmful, since infection could spread despite all precautions. Spraying with a 5–5–50 Bordeaux mixture and dusting with a 20–80 monohydrated copper sulfate-hydrated lime mixture were found to be about equally effective in control, with results slightly in favor of the spray. The addition of oil spreaders to the Bordeaux mixture did not increase its efficiency. Freshly mixed dusts were found to be generally more effective than similar

commercial mixtures. The substitution of inert materials, such as kaolin and infusorial earth, for part of the lime did not increase the effectiveness of the dust but did produce variations in flowing and adhesive qualities. Dusting in the early morning when the foliage was damp was most effective. Spraying was less costly than dusting, but this differential was often offset by a saving in time and labor, and on small fields where power outfits were impractical, dusting was the most satisfactory. The ease with which different dusts passed through the machine was found to be an important factor in determining the amount of material required per given area.

Maize chlorosis, E. F. S. SHEPHERD (*Trop. Agr. [Trinidad]*, *6 (1929), No. 11, p. 320*).—Notes are given regarding chlorosis of maize and other grains in Mauritius, as well as an account of the discovery and comparison of information related to this condition as published by Kunkel (E. S. R., 46, p. 344), Shepherd (E. S. R., 54, p. 250; 56, p. 848), Stahl (E. S. R., 60, p. 240), and Storey (E. S. R., 56, p. 649).

So-called streak and stripe are regarded as distinct diseases, having different vectors. Protective measures recommended include roguing and weeding out of grasses, especially wild forms.

Onion immunity trials, 1927, R. M. NATTRASS (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1927, p. 106*).—A further trial (E. S. R., 59, p. 242) regarding the immunity or resistance of onion varieties to white rot (*Sclerotium cepivorum*) carried out in collaboration with E. Holmes-Smith, using onion seed sown on infected soil early in August, 1926, the plants being lifted June 3, 1927, gave of diseased bulbs for Italian Tripoli 11.4 per cent, Lemon Rocco 4.3, Globe Tripoli 13.9, White Welsh 29, White Globe 8.6, and White Lisbon 25 per cent.

A tuber rot of Irish potatoes, J. A. MCCLINTOCK (*Tennessee Sta. Circ. 32 (1930), pp. 4, fig. 1*).—Tuber rot due to *Sclerotium rolfsii*, a disease which under favorable temperature conditions causes severe injury to the early spring crop of potatoes, was found in studies at the West Tennessee Substation to be increasingly prevalent as the harvesting date was deferred. Records taken on June 2, June 17, July 2, and July 17 harvests showed 0, 6, 43, and 70 per cent of infected tubers, respectively, with yields of marketable tubers of 120, 146, 146, and 86 bu. per acre. The difficulty in the control of the disease is enhanced by the fact that approximately 150 species of plants, including cultivated and wild forms, are susceptible to the organism. The results in other States are cited to the effect that *S. rolfsii* makes no growth below 46° F., little growth between 46 and 68°, and reaches a maximum between 86 and 95°, with growth inhibited at 99° or above. As a result of this temperature response the fall crop was not subject to the disease.

Gumming disease of sugar-cane, S. F. ASHBY (*Trop. Agr. [Trinidad]*, *6 (1929), No. 5, pp. 135–138*).—Following up a review of the account formerly noted (E. S. R., 58, p. 50) with other historical information and references, the author details results of a study of cultures from gummed cane which were obtained for him by D. S. North in New Zealand. The present notes deal with the bacterium which causes gumming disease of sugarcane and with two other bacterial diseases of the same host.

The behavior of the new POJ canes in relation to sugar cane mosaic in Cuba, C. F. STAHL and J. A. FARIS (*Trop. Plant Research Found. [Wash., D. C.] Bul. 9 (1929), pp. 12, figs. 4*).—Results are given in tabular and detailed form as issuing from tests and breeding experiments with certain POJ canes indicated.

The occurrence of Phacidiella discolor Pot. in the Bristol Province, R. M. NATTRASS (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1927, pp. 99,*

100, pl. 1).—In the 1926 report (E. S. R., 59, p. 239) attention was drawn to a disease of head-worked apple trees taking the form of a shallow canker of varying extent on the old wood just below the graft and showing a fungus claimed as *Fuckelia conspicua*, the conidial stage of *P. discolor*, not previously recorded for the region. Observations during the 1927 season have been made regarding the disease on pear trees in Worcestershire. The disease is described as not attacking healthy trees and as being a somewhat weak parasite, not yet observed to attack the fruit locally, though it occurs so on the Continent.

A biochemical note with respect to an apple tree affected by "silver leaf" disease, F. TUTIN (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1927, pp. 91, 92, pl. 1*).—Referring to a previous report (E. S. R., 57, p. 514) the author states that the apple tree referred to has been under observation since 1920. The data now presented afford confirmation of the conclusions previously reached that silver leaf of apple trees is accompanied by a deficiency of pectin in the leaves.

Arsenical sometimes injures peach trees, W. C. DUTTON (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 55, 56*).—A brief article describing the manifestations of arsenical injury on the leaves, bark, wood, and shoots of the peach, and suggesting methods for reducing this hazard.

Investigations on die-back of fruit trees.—I, A preliminary experiment and some field observations on Diaporthe perniciosa as a cause of "die-back" of plum trees, R. W. MARSH and R. M. NATTRASS (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1927, pp. 93–98, pl. 1*).—Having succeeded to the work previously carried on by Briton-Jones (E. S. R., 57, p. 53), the present authors outline their study of the strain of *D. perniciosa* isolated from diseased tissue of a young plum tree showing typical die-back, grown for 12 days on malt agar slants, and afterwards used as inoculum, August 25, 1926, on plum trees ringed with a knife edge cut about 2 ft. above ground level. The resulting cankers were typical of those found in nature.

Fructifications occurred on one or two cankers, though no tree was killed. The development of the *D. perniciosa* resembled that described by Cayley (E. S. R., 52, p. 149). A descriptive account is given.

A detailed account of field observations is credited to Nattrass.

Further experiments on the control of the American gooseberry mildew, season 1927, R. M. NATTRASS (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1927, pp. 101–103*).—In continuation of the experiments previously reported (E. S. R., 59, p. 645; 60, p. 450), now carried on under conditions of heavy infection and thus favorable to the disease, it was found that two applications of flowers of sulfur reduced the mildew from 69 to 5.8 per cent, a point regarded (considering the conditions) as marking very good commercial control. One application of ammonium polysulfide reduced the mildew to 17.6 per cent, this result emphasizing the point that a hitting spray of this type must be applied more than once unless the weather conditions favor control. Promising results were obtained with a single application of colloidal sulfur, which is regarded as a protective rather than a hitting spray. It remains on the foliage for some time and gives no sign of scorching. Excellent control was given by each of the three forms of powdered sulfur, the difference between 3.1, 1.6, and 1 per cent for flowers of sulfur, green sulfur, and ground sulfur not being considered significant.

Panama disease research, C. W. WARDLAW (*Trop. Agr. [Trinidad], 6 (1929), No. 7, pp. 192–197*).—This account, said to be a summary of two reports submitted to the Empire Marketing Board on the author's research at the Imperial College of Tropical Agriculture, is concerned with a statement of facts

regarding preliminary experiments on the inoculation of roots and suckers rather than with the final implications of such observations and findings.

"The extent of an infection which normally may take a year to run its course in the field can not be prejudged on observations limited to the first few months of exposure to the parasitic organism. Collectively the results obtained so far show that despite the virulent parasitism attributed to *F[usarium] cubense*, inoculated suckers grown under conditions of uniform moisture and adequate aeration resist fungal invasion by defensive structural and biochemical modifications. . . . The results obtained are simply records of the limited parasitism found when suckers are maintained under controlled conditions favorable to healthy growth. . . . While the evidence submitted in these reports indicates that the intensity of the infection and the power of the plant to react are conditioned by certain external factors, it would be unwise to prejudge final results on preliminary findings."

Witch-broom in Suriname, C. W. Wardlaw (*Trop. Agr. [Trinidad], 6 (1929), No. 12, pp. 348, 349*).—A brief historical and statistical account is given of the witches' broom disease of cacao in Surinam, noting the causal organism, *Marasmius perniciosus*, as described by Stahel (E. S. R., 34, p. 847), and discussing the influence of this organism on yields.

Limes and wither-tip, R. O. Williams (*Trop. Agr. [Trinidad], 6 (1929), No. 7, pp. 187–191, pls. 2*).—This account of introduction and breeding work in Trinidad states that palliative measures do not constitute a practical means of control of the withertip disease, which has caused severe losses in the lime industry in the West Indian Islands. Plant introduction has failed thus far to furnish a lime having the needed characters, though P. I. No. 2182 crossed with West Indian lime has given good results and Trinidad hybrid No. 1 shows promise of commercial value. Back-crossing of the resistant hybrids with their female parent has been initiated, and seedlings are now being raised.

The wilt disease of the carnation, H. L. White (*Jour. Pomol. and Hort. Sci., 7 (1929), No. 4, pp. 302–323, pl. 1, figs. 2*).—From this study of carnation wilt it is concluded that in England this disease is caused mainly by *Fusarium* spp., including *F. culmorum*, *F. acuminatum*, *F. anthophilum*, and *F. herbarum*, different disease forms associating with different infection types, though without correlation between infection type and species. Strains of *F. culmorum* from the aster, chrysanthemum, and tomato, growing in situations previously free from carnation, are pathogenic to carnation. *F. culmorum* on carnation causes wilt of potato and aster and stem lesions in tomato. Wilt in carnation is caused also by *F. sporotrichoides* associated with carnation bud rot.

The progress of the disease in commercial nurseries is most rapid in the root type, the soil being contaminated over considerable areas. It is slow in aerial infection of cut stems. Means of infection in commercial nurseries are air, water, and soil carriage. Entrance is almost always gained by way of wounds. Maximum wilting occurs during the hot weather, April to August. Environmental conditions may favor epidemic spread. Variation in constitutional resistance within a variety is thought to be due to variant conditions in different nurseries. Rotation offers little promise of protection, and development of resistant strains appears the best hope. Other possibilities include healthy stock, uncontaminated water supply, soil sterilization, and avoidance of injuries.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Birds of Sweden, M., W., and F. von Wright and E. Lönnberg (*Svenska Fåglar efter Naturen och på Sten Ritade. Stockholm: Ivar Baarsen, 1924, vol. 1, pp. 9+295, pls. 146, figs. 32; Stockholm: Förlaget Svenska Fåglar, 1929,*

vols. 2, pp. 9+295–546, pls. 119, figs. 25; 3, pp. 16+547–902, pls. 109, figs. 49).—An extensive folio of colored plates of the birds of Sweden by M., W., and F. von Wright accompanied by descriptions by E. Lönnberg.

Swedish birds, E. Lönnberg (*Stockholm: I. Haeggströms Boktr., 1929, pp. XX*).—This review in English of the work above noted is followed by a systematic list of Swedish birds as dealt with in the three volumes. It is pointed out that the number of species and subspecies of birds which have been found in Sweden may be estimated at about 335, to which may perhaps be added a few more subspecies the status of which is not yet quite clear, and a few introduced species. Of the whole number, not including the introduced ones, 236 have been known to breed in Sweden more or less regularly, in some instances, however, only a few times.

Birds and green places, A. H. Chisholm (*London: J. M. Dent & Sons; New York: E. P. Dutton & Co., 1929, pp. XIV+224, pls. 50, fig. 1*).—This is a popular account relating largely to the birds of Queensland, Australia.

Surinam and Dominican toads, D. W. May (*Porto Rico Sta. Rpt. 1929, p. 4, fig. 1*).—The giant toad (*Bufo marinus*), first introduced into Porto Rico from Barbados five years previously, has been sent to different parts of the island in lots varying from 12 to 2,000. They have become well established, and apparently are effective in reducing the depredations of some of the worst insect pests, especially the night feeders and the burrowers. The Surinam toad [*Pipa americana*] has not been found to be adapted for use as food. During the year 12 frogs (*Leptodactylus pentadactylus*) were introduced from Dominica and released near Mayaguez with a view to their serving as destroyers of insects and also proving valuable as a food product.

Insects: Their ways and means of living, R. E. Snodgrass (*New York: Smithsn. Inst. Ser., Inc., 1930, pp. [13]+IV+362, pls. 15, figs. 186*).—This popular account, issued as volume 5 of the Smithsonian Scientific Series, deals with many of the more common insects.

On the part played by parasites in the control of insects living in protected situations, W. R. Thompson (*Bul. Ent. Research, 20 (1929), No. 4, pp. 457–462*).—This is a general discussion of the subject.

New protection against stored-grain insects, W. P. Flint and C. O. Mohr (*Illinois Sta. Bul. 359 (1930), pp. 375–390, figs. 6*).—Experimental work has shown that the dipping of ears of corn in the common oil emulsions and miscible oils now generally used for spraying fruit trees will protect them from attack by many of the insects that injure stored grain. "Seed corn treated with commercial emulsions made from highly refined oils was effectively protected from insect injury, and the germination of the corn was not affected. Boiled homemade lubricating oil emulsion was very effective in protecting ear corn against damage by insects. When potassium oleate was used in such emulsion, germination was not injured. Some of the commercial miscible oil orchard sprays gave very good protection but injured germination. Preliminary feeding tests would seem to indicate that treated corn can be fed to horses, cattle, hogs, and chickens without harmful effect."

[Work in economic entomology at the Alabama Station] (*Alabama Sta. Rpt. 1929, pp. 22–24, 26*).—In work with citrus insects, by L. L. English, 60 days were found to be required for the completion of the first generation of the purple scale and from 56 to 60 days for the completion of the first generation of the citrus white fly. It was observed that the injury to Satsuma trees resulting from the application of oil emulsions may be manifested as "shot holes," "corky areas," "burn," defoliation, fruit drop, or failure to set a crop of fruit. It is pointed out that the unsaturated oils were more likely to cause damage in any

of the forms than the saturated oils. Spraying in the late fall with oils is hazardous on account of the cold injury. In combating the overwintering larvae of the citrus white fly, the more viscous oils (80 to 140 Saybolt) gave satisfactory control at an oil concentration of 1.5 per cent. A single application of oil at 2 per cent (oil basis) failed to give satisfactory kill of purple scale on heavily infested trees.

Further observations on the life history of the belted bean beetle, from July 21 to September 26, 1928, are reported by J. M. Robinson (E. S. R., 64, p. 161). The average number of days for the completion of the life cycle was 29.8, the range varying from 27.2 to 33 days. Four complete generations were observed from July 21, 1928, to June 21, 1929. Observations of overwintering beetles revealed that 108 females deposited 21,321 eggs from November 18, 1928, to April 30, 1929, an average of 197 eggs per individual, with 37 as the average number per deposition.

Boll weevil control work with calcium arsenate was continued by Robinson and F. S. Arant on three soil types. On Norfolk sandy loam plats dusting seemed to be profitable if the potential yield is one-half bale or more per acre, or if the infestation exceeds 10 per cent during the time the crop is being set. On heavy red clay where the infestation was 20 per cent on July 27, six dustings kept the infestation below that percentage, with one exception, until August 28. The 5-year average gain from dusting was 282 lbs. of seed cotton per acre, as contrasted with the 490-lb. gain in 1928. On the Houston clay Black Belt plat where the infestation was 16 per cent on June 19, three applications of calcium arsenate reduced the infestation to 6 per cent on July 12. The 5-year average gain from dusting was 258 lbs. of seed cotton per acre, as contrasted with the 372-lb. gain in 1928.

The three-cornered alfalfa hopper (*Stictocephala festina* Say) was found by J. F. Duggar to wound the stems, causing the yellowing of the foliage of alfalfa. In recent years in the Alabama Black Belt alfalfa area this crop has declined greatly in yield and in thickness and duration of stand. The percentage of branches girdled by this insect, found in counts made at random in seven alfalfa fields, averaged 38. The unthriftiness of the plants or the thinning of the stand was repeatedly found to vary with the number of insects or of insect wounds. In work at the laboratory both the immature and winged stages of this leafhopper were readily killed by blowing a dust of a nicotine preparation, pyrethrum, or diluted sodium fluosilicate through the wire cages in which the leafhoppers were confined. The habits of the insect suggest that their injury to alfalfa may be decreased by fall planting, by completely eradicating some months in advance of sowing any adjacent growth of thin alfalfa or sweetclover, and by forcing alfalfa into rapid growth by the choice of suitable soil and by the use of phosphate.

[Biennial report of work with economic insects at the Oregon Station, 1928–1930] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 16, 17, 86–90, 126–128, 138, 139*).—In further studies of the life history and control of the strawberry root weevil (*Brachyrhinus ovatus* L.) and the rough strawberry root weevil (*B. rugosostriatus* Goeze) (E. S. R., 61, p. 52), work with baits showed definitely that a bran bait is as effective as any other and can be made up easily and cheaply. For the former, two well-timed applications of poisoned apple bait were found completely successful. Two native pests, the decorated strawberry root weevil *Dyslobus decorata* Lec. and the western strawberry root weevil *D. ursinus* Horn, have appeared in destructive numbers in new localities each year until at present the former is probably the most serious root weevil attacking strawberries in the State, the larvae working most vigorously in the

heat of summer and killing the plants outright in a very short time. The adults appear early in the spring, during March, at a time when it is very difficult to apply control measures. Very encouraging results were obtained against *D. decorata* during the 1930 season, more than 90 per cent control having been obtained with a bran-sodium fluosilicate bait. A brief reference is made to work with the strawberry crown moth, which has become a very serious pest of strawberries in the State.

Experiments with the destructive pear thrips, which caused a total failure of the Italian prune crop in the Willamette Valley in 1927, are under way.

In experiments with sprays 100 per cent control of the narcissus bulb fly was obtained in the 1930 season from the application of Bordeaux oil emulsion. By this method the fly is destroyed before any injury to the bulb takes place.

In work with substitutes for lead arsenate in combating the codling moth, it was found that calcium arsenate gave just as good control. Of the other insecticides tested pyrethrum gave the best results, although not as good as the arsenates. Oil emulsion alone gave poor worm control, but combined with lead arsenate gave better control than did lead arsenate alone. Counts of wormy apples at picking time showed that 4 and 6 lbs. to 100 gal. of lead arsenate in the cover sprays gave about equal control and better than did 2 lbs. to 100 gal. The use of oil with lead arsenate did not prevent the removal of arsenical residue to below 0.01 grain per pound, even when light weight oils were used as late as August 16. Field tests with light weight oils gave from 96 to 100 per cent kill of eggs already laid, when used at dilutions as low as 1 gal. of the emulsion per 100, but had no effect on eggs laid on oil-sprayed trees the same and the following nights. Up to the present time observations indicate that oils with a viscosity range of from 65 to 75° F. can be used in the first two cover sprays without causing injury of importance.

In control work with the bean leaf beetle, officially known as the western spotted cucumber beetle, it was found that lead arsenate and other poison dusts and sprays acted as repellents and that few beetles were killed by these materials. Pyrethrum, when used in proper dilutions, killed readily when actual contact with the beetles was made.

In limited tests of the Syneta leaf beetle (*S. albida* Lec.) on cherry, the molasses spray was no more effective than the straight lead arsenate-lime spray 4 to 100.

The black gooseberry borer (*Xylocrius agassizi* Lec.) and the currant fruit fly continue to be very serious and destructive enemies of the gooseberry in the State.

The symphilid or garden centipede *Scutigerella immaculata* (Newp.) continued increasingly injurious from year to year. Preliminary observations and control tests conducted indicate that none of the known soil fumigants are effective and feasible in combating it.

In preliminary experiments poison dusts were applied against the native strawberry leaf beetle, *Timarcha* sp., with encouraging results.

The European or dusky-veined walnut aphid *Callipterus juglandis* Frisch appeared in July, 1928, in the Willamette Valley districts in the vicinity of Dundee, for the first time in the United States, infesting between 2,000 and 3,000 acres of walnuts. It is much larger than the ordinary walnut aphid (*Chromaphis juglandicola* Kalt), from which it differs in that it works entirely on the upper surface of the leaves. As many as 50 aphids were found on a leaf, located in a double row along the midrib of infested leaves, the midribs becoming blackened, while the leaves became sickly in appearance and blotched with yellow. The first control measures were applied July 20, 1928, at which time the wingless forms were the most numerous, few winged forms being

observed. A 2 per cent nicotine dust thoroughly applied between midnight and 8 a. m. gave excellent control.

Observations made during the two years under report further substantiated the fact that the woolly apple aphid is definitely associated with the advance of fully 90 per cent of the perennial canker infection on apple trees in the Hood River Valley. In control work it was found that nicotine sulfate added to paints at the rate of 1 part of nicotine sulfate to 4 and 6 parts of paints gave complete aphid protection throughout the season. The paints tested included various combinations of tanglefoot, diluted with equal parts of gasoline and carbon tetrachloride to a point where the material could be applied with a brush, and the Hood River tree paint, a rosin-fish oil-Bordeaux combination. Reference is made to the introduction of the woolly apple aphid parasite *Aphelinus mali*, which was liberated for the first time in the Hood River Valley in the fall of 1928 from material from Michigan. The parasite has successfully survived two winters in the field and has spread rapidly from the points of liberation.

During the last year the damage caused by the thrips *Frankliniella occidentalis* and *Aeolothrips fasciatus* to fruit was materially reduced through the use of nicotine sulfate applied at the time when about 50 per cent of the blossoms were open. Oil sprays were found to be less effective.

Lime sulfur applied at the rate of 12 gal. in 100 gave the best control of the San Jose scale on apples and pears. Summer oil sprays for the scale were of great benefit where the dormant spray had been omitted.

Experiments indicate that it is not advisable to spray Winter Nelis pears with dormant oils, since this variety is very susceptible to injury from these oils.

[Report of work in entomology at the Tennessee Station], S. MARCOVITCH (*Tennessee Sta. Rpt. 1929, pp. 33–35*).—In work with cutworms, the station collection of the adults of which now contains over 174 species, sodium fluosilicate was found to be more toxic than any arsenical tested. In insecticidal control work with the woolly aphid carbon disulfide emulsion gave the most promise, controlling the aphid when used in a dilution of 1 to 200 at the rate of 1.5 pints per square foot of soil. While such treatment is rather expensive and may not be practical for the nurseryman, it can be used economically in the newly set orchard.

Pests mentioned as being especially abundant and damaging during the year include termites, the bagworm, pickleworm, bean beetle, and oriental fruit moth. The oriental fruit moth has increased rapidly, until during the year as high as 50 per cent loss was suffered, it being especially serious in those sections where apple and peach are planted together.

Sixtieth annual report of the Entomological Society of Ontario, 1929 (*Ent. Soc. Ontario Ann. Rpt., 60 (1929), pp. 161, figs. 8*).—In the first part of this report the insects of the season 1929 (E. S. R., 62, p. 541) are reported for the several Provinces, those in Nova Scotia, by F. C. Gilliatt (pp. 6–10); New Brunswick, by R. P. Gorham, G. P. Walker, and L. J. Simpson (pp. 10–14); Quebec, by G. Maheux and C. E. Petch (pp. 14–17); Ontario, by L. Caesar and W. A. Ross (pp. 17–23); Manitoba, by A. V. Mitchener and N. Criddle (pp. 23–26); Saskatchewan, by E. McMillan and K. M. King (pp. 26–29); northern Alberta, by E. H. Strickland (p. 30); southern Alberta, by H. L. Seamans (p. 31); and British Columbia, by E. R. Buckell (pp. 32, 33).

The following contributions are then presented: The History and Present Status of Entomology in the Universities and Colleges of Canada, by A. W. Baker (pp. 33–46); Some Preliminary Observations on the Flight of the Euro-

pean Corn Borer, by G. M. Stirrett (pp. 46–51); Progress in Breeding Corn to Resist the European Corn Borer (*Pyrausta nubilalis* Hbn.), by A. R. Marston (pp. 51–53): Progress Report on Corn Borer Control, by L. Caesar (pp. 54–56); The Role of Chemistry in the Control of Insects, by J. W. Burns (pp. 57–59); Some Problems of a Chemical Nature of Interest to the Entomologist, by F. A. Herman (pp. 59–63); Injury to Potatoes by Larvae of *Agrotis ypsilon* Rott., by R. P. Gorham (pp. 63–65): Experiments on the Control of the Wheat Stem Sawfly by Parasites, by H. L. Seamans (pp. 65–67); The Life-History of the White Cutworm, *Euxoa scandens* Riley, by H. F. Hudson and A. A. Wood (pp. 67–70): The Spread and Distribution of the Satin Moth in British Columbia, by L. S. McLaine and D. Glendenning (pp. 70–73); The European Pine-Shoot Moth (*Rhyacionia* (*Evetria*) *buoliana* Schiff.) in the Niagara Peninsula, by R. W. Sheppard (pp. 73–76); Notes on the Fir Sawfly, *Neodiprion abietis* Harris, by R. D. Bird (pp. 76–82); Insect Pests (or Insect Allies) That Have Recently Arrived in Vancouver District, British Columbia, 1928–1929, by G. J. Spencer (pp. 82–84); The Biology of *Nemeritis canescens*, a Parasite of the Mediterranean Flour Moth, by V. R. Diamond (pp. 84–89); Mosquito Control in New Jersey, by F. W. Miller (pp. 89–92); Some Observations and Remarks on Mosquito Control, by C. R. Twinn (pp. 92–96); An Outbreak of Mycetophilid and Chironomid Larvae in a Large Commercial Greenhouse, by R. W. Thompson (pp. 96–99); Two Insects Destructive to Iris [*Mononychus vulpeculus* Fab. and *Argyroploce hebesana* Walk.], by A. Gibson (pp. 100–102); The Tarnished Plant Bug *Lygus pratensis* L.: A Progress Report, by R. H. Painter (pp. 102–107); Preliminary Notes on the Mortality and Feeding Habits of Newly Hatched Oriental Peach Moth Larvae, by G. G. Dustan (pp. 108–111); Experiments with Larvicides Directed against Overwintering Codling and Oriental Peach Moth Caterpillars, by W. A. Ross, J. A. Hall, and T. Armstrong (pp. 111–116); Some Oriental Peach Moth Control Studies with Special Reference to the Use of Lime and Talc Sprays, by W. A. Ross, T. Armstrong, and D. F. Patterson (pp. 116–124); Notes on the Natural and Introduced Parasites of the Oriental Peach Moth (*Laspeyresia molesta* Busck) in Ontario, by W. E. Steenburgh (pp. 124–130); The Ontario Spray Service, by L. Caesar (pp. 130–132); The Mediterranean Fruit Fly Situation in Florida, by L. S. McLaine (pp. 133–137); Leaf Rollers Attacking the Apple in Norfolk County, Ontario, by J. A. Hall (pp. 137–139); A New Orchard Pest in Ontario [*Simaethis pariana* Clerck], by L. Caesar (pp. 140, 141); An Insect Survey of Illinois, by T. H. Frison (pp. 141–146); and The Entomological Record, 1929, by W. J. Brown (pp. 146–157).

The principal insects and diseases of cultivated citrus in Argentina [trans. title], E. E. BLANCHARD (*Min. Agr.* [*Argentina*], *Secc. Propaganda e Informes* [*Circ.*] *815* (*1930*), *pp. 114, pls. 8, figs. 44*).—This is a practical account.

Report of the director of the Central Entomological Station and the director of the Central Plant Pathological Station for 1929 [trans. title], P. MARCHAL, E. FOEX, ET AL. (*Min. Agr.* [*France*], *Ann. Épiphyties, 15* (*1929*), *No. 6, pp. 317–423*).—This is the usual annual report on phytopathology, including both insect enemies and plant diseases, by the directors of the work in France (E. S. R., 63, p. 253). Reports summarizing the work of the several laboratories for 1929 by the directors thereof follow.

[Contributions on economic insects] (*Min. Agr.* [*France*], *Ann. Épiphyties, 15* (*1929*), *Nos. 1–2, pp. 1–96; 3, pp. 125–181, pls. 3, figs. 10; 4, pp. 185–236, pls. 3, figs. 8; 5, pp. 256–316, figs. 18*).—The following contributions are presented: Poison Baits: Their Utilization in Combating Crop Pests [trans. title], by A. Douence (pp. 1–96), which includes a bibliography of eight pages; The

Enemies of the Woolly Apple Aphid and Biological and Climatic Conditions Affecting Its Multiplication: Insecticide Treatments [trans. title], by P. Marchal (pp. 125–181), including a bibliography of three pages; The Migratory Locust (*Locusta migratoria capito* Sauss.) in Madagascar [trans. title], by B. N. Zolotarevsky (pp. 185–236); and General Conditions Influencing the Multiplication of Aphids [trans. title], by L. Gaumont (pp. 256–316).

Report of the entomologist for 1929, H. M. Morris (*Cyprus Dept. Agr. Ann. Rpt. 1929, pp. 47–56, pl. 1*).—The author reports upon the fumigation of citrus fruits for exportation, fumigation of citrus trees, olive pests, insects in stored grain, and the locust campaign, which was for the first time placed under the charge of the Government entomologist.

Annual report of the entomologist to Government, Punjab, Lyallpur, for the year 1928–29, M. Afzal Husain (*Punjab Dept. Agr. Rpt., 1928–29, pt. 2, I, pp. 137–170*).—This report deals with the occurrence of and work with the pests of cotton, including tabular data on the bollworm (*Earias insulana*) and the pink bollworm; of sugarcane, maize, and jowar; and of gram, fodder, rice, fruit, vegetables, and stored grain. Tabular data on the effect of treating sugarcane sets as protection against white ants are included. A discussion which follows (pp. 159–170) deals with rats and antirat operations; with birds, including monthly tabulations of percentages and different foodstuffs taken by doves (*Streptopelia* spp.) for the first six months in 1929 and by pigeons (*Columba* spp.) for the same period; and with sericulture and lac culture.

Entomology memoirs.—Memoir No. 6 (*Union of So. Africa Dept. Agr., Ent. Mem. 6 (1929), pp. 74, figs. 14*).—This sixth memoir (E. S. R., 59, p. 455), consists of Notes on the Bionomics of *Xanthodes graellsi* Feisth. (Noctuidae, in the Eastern Transvaal, with Description of Eggs, Larva, and Pupa, by J. S. Taylor (pp. 5–8); Biological Notes on the South African Trypetidae (Fruit-flies: Diptera), III, by H. K. Munro (pp. 9–17); and Studies on Reactions of the Natal Fruit-fly to Fermenting Baits (pp. 19–53), and a New Olfactometer Successfully Used with Fruit-flies (pp. 55–74), both by L. B. Ripley and G. A. Hepburn.

Notes on some natural enemies of Plodia interpunctella and Silvanus surinamensis in Australia, J. G. Myers (*Bul. Ent. Research, 20 (1929), No. 4, pp. 425–430*).—Notes are presented on certain aspects of the behavior of several enemies of the Indian meal moth and saw-toothed grain beetle, with special reference, in the case of the parasites, to oviposition habits. The natural enemies considered include *Microbracon hebetor* Say, *Cephalonomia* sp., *Nemeritis canescens* Grav., and ants.

Investigations on "spotted wilt" of tomatoes, G. Samuel, J. G. Bald, and H. A. Pittman (*Aust. Council Sci. and Indus. Research Bul. 44 (1930), pp. 64, pl. 1, figs. 39*).—In investigations of the transmission of spotted wilt disease of tomatoes, first observed near Melbourne, Australia, in the season of 1915–16 and since reported from all the States of Australia, transmission has consistently been obtained with *Frankliniella insularis*. The disease has become by far the most serious tomato disease in the southern States, some years causing enormous losses. This thrips, for which the name "black carnation thrips" is suggested, has been found in association with all cases of the disease both outdoors and in the greenhouse that have been examined in South Australia and occurs in New South Wales, Western Australia, and at Bendigo in Victoria. It has not, however, been found near Melbourne, where the disease appeared and is still severe in certain seasons.

"Observations on the life history of the insect are given and illustrations of the feeding marks it makes on tomato leaves, which it is important for

glasshouse growers to be able to recognize, since the insect is present only in very small numbers and is difficult to find. An infective individual of *F. insularis* may inoculate a plant with spotted wilt in as short a period of feeding as six hours; shorter periods have not yet been tested. Infective individuals fed for successive days on fresh healthy plants did not infect every plant on which they fed. Infection was very erratic, but the infective principle was retained in the insects during the 24 days the experiment lasted. If a larva has fed on a diseased plant, the adult which hatches from its pupa may be infective without further feeding on a diseased plant.

"Tobacco and *Nicotiana suaveolens* have both been infected by the feeding of virus-bearing *F. insularis*. There are indications that the host range of the disease among Solanaceae is considerably wider, and further work is proceeding upon this aspect of the disease. None of the 48 commercial varieties of tomato tested is appreciably resistant to the disease. The small red currant tomato is fairly resistant, and this is being crossed with standard varieties in an effort to combine resistance with commercial qualities. Experiments on control of the disease by the use of insecticidal dusts and sprays, and by fumigation in tomato glasshouses, have not given encouraging results, and serve to direct attention to the need for further knowledge of the biology of the vector insect, *F. insularis*.

"A comparison is made between the symptoms and properties of spotted wilt and those published for streak or winter blight of tomatoes in North America, from which it is concluded that the two diseases are distinct."

Other insects tested as vectors of the disease, including a jassid, 2 aphids (probably *Macrosiphum gei* and the green peach aphid), the greenhouse white fly, red spider (*Tetranychus telarius*), a mite (*Phyllocoptes lycopersici*), and the onion thrips and *Hemianaphothrips* sp., gave negative results.

A list is given of 17 references to the literature.

Description and bionomics of Frankliniella insularis Franklin (Thysanoptera), J. Davidson and J. G. Bald (*Bul. Ent. Research, 21 (1930), No. 3, pp. 365–385, figs. 7*).—A report of studies of this thrips, which is found on various food plants, including tomatoes, in the Adelaide area of Australia. The species is of economic importance, it having been shown by Samuel, Bald, and Pittman (above noted) experimentally to be able to transmit the virus of spotted wilt disease of tomatoes.

The tobacco capsid (Engytatus volucer Kirk.) in Rhodesia, J. I. Roberts (*Bul. Ent. Research, 21 (1930), No. 2, pp. 169–183, pl. 1, figs. 2*).—A description is given of the adult and various instars of *E. volucer* and its habits on tobacco. Attempted transmission of tobacco mosaic by Hemiptera found on tobacco plants failed. "Further experiments with the macerated contents of the thorax of *E. volucer* have proved it to cause a rolling and puckering of the leaf surface which is termed 'crinkle.' Crinkle is caused by the poisonous nature of the saliva which spreads rapidly through the interior of the leaf. The salivary action does not affect localized centers to any appreciable extent so as to cause a 'shot hole' effect, as observed with other capsids. The feeding sites are only noticeable when the leaf is held up to the light; rapid translocation currents cause its action to be spread over larger areas. The injury is aggravated in weakened plants grown under adverse conditions, such as the striking of a hard pan in the subsoil or a stone, or water deficiency. Control can be effectively carried out by thorough cultivation of the soil and the choosing of suitable subsoils for root development. Early planting in December is recommended, or even earlier if rains are suitable, so that the plants will be well established before the height of infestation in April."

A list of 28 references to the literature is given.

A new species of Erythroneura (Homoptera, Jassoidea) injurious to cassava in East Africa, W. E. China (*Bul. Ent. Research, 21 (1930), No. 3, pp. 267, 268, fig. 1*).—Under the name *E. cassavae* n. sp. the author describes a new jassid attacking cassava in Tanganyika Territory, East Africa.

Carabunia myersi Watrst. (Hym., Encyrtidae), a parasite of nymphal froghoppers (Hom., Cercopidae), J. G. Myers (*Bul. Ent. Research, 21 (1930), No. 3, pp. 341–351, fig. 1*).—A report of studies of *C. myersi*, an extraordinarily efficient internal parasite of the nymphs of *Clastoptera undulata* and *Clastoptera* sp. in Cuba and of a third species in the mountains of Haiti. The rate of parasitism was found to be from 65 to nearly 100 per cent. "The egg is laid in nymphs of about the second instar, the female wasp negotiating the covering spittle-mass with great ease. There are three larval stadia, and pupation takes place within the indurated larval skin of the last larval instar, inside the abdomen of the still active host. The spiracles of this hymenopterous puparium achieve connections with certain of the abdominal tracheae of the host and by this means supply air to the pupa. Dissection and experiment showed that Carabunia is not actually, nor is it likely to become, a parasite of froghoppers of the genus Tomaspis (Monecphora) to which the Trinidad cane pest belongs."

Preliminary note on leaf-crinkle of cotton in the Gezira area, Sudan, T. W. Kirkpatrick (*Bul. Ent. Research, 21 (1930), No. 2, pp. 127–137*).—An account of a disease of cotton occurring in the Gezira area of the Sudan known as leaf crinkle, and of transmission experiments which indicate that the affection is conveyed by white flies and that they are the main and probably the only vectors of the disease.

Apple aphids in Ohio, C. R. Cutright (*Ohio Sta. Bul. 464 (1930), pp. 59, figs. 20*).—The first part of this bulletin (pp. 3–17) consists of a popular account of the apple aphids found in Ohio, including the apple grain aphid, the rosy apple aphid, the apple aphid, and the woolly apple aphid. It is pointed out that the clover aphid is rarely found in the State on apple and has never appeared in numbers sufficient to be considered of economic importance.

The second part consists of a technical section (pp. 18–57), in which control work with the three first-mentioned aphids is given the greatest attention. Work of a biological nature was attempted with the apple aphid, including the prediction of outbreaks of the apple aphid and environmental resistance as affecting it, and is reported under the headings of factors affecting (1) the egg, (2) their stem mothers and their immediate progeny, (3) migrants and the summer generations, and (4) fall migrants and sexes. Control phases are considered under the headings of dormant and delayed dormant spraying against apple aphids; tests of spray materials against aphid eggs; laboratory experiments with newly hatched aphids; field experiments against apple aphids—dormant and delayed dormant spraying; summary of results obtained by spraying in the dormant and delayed dormant periods; summer spraying against the apple aphid; and fertilization, cultivation, and pruning in relation to the apple aphid. Much of the data is presented in tables, of which there are 25.

A list is given of 26 references to the literature.

***Sugar-cane borers:* The control of Diatraea saccharalis in Barbados by mass liberations of Trichogramma minutum,** R. W. E. Tucker (*Trop. Agr. [Trinidad], 7 (1930), No. 11, pp. 292–295*).—An account of control work through the distribution of *T. minutum*, the total liberation of which for the year 1929 was 22,816,700. The results already obtained are said to give promise of satisfactory economic control of Diatraea in Barbados.

Control methods for squash vine borer given, R. Hutson (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 54, 55, fig. 1*).—A brief practical account, in which it is pointed out that spraying and clean-up measures prevent the squash borer from seriously injuring squash and pumpkin plantings.

European pine shoot moth found in Michigan, E. I. McDaniel (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 69–71, figs. 2*).—A brief practical account of the European pine shoot moth, which was collected on Scotch pine in the vicinity of Ann Arbor and Detroit, Mich., in the summer of 1930, this being the first known record of the pest in the State. Reference is made to a study of the pest by Busck, previously noted (E. S. R., 32, p. 654).

Observations on the parasites of the pine-shoot moth, Rhyacionia buoliana Schiff., W. H. Thorpe (*Bul. Ent. Research, 21 (1930), No. 3, pp. 387–412, figs. 8*).—A report of a preliminary study of the parasites of the European pine shoot moth in England at the Imperial Institute of Entomology, undertaken at the request of the Dominion entomologist of Canada.

"In all 28 species of primary and secondary parasites were obtained. Thirteen of these species were represented in our material by not more than two specimens and are probably of little economic importance. Of the remaining 15, 2 (Habrocytus and Eutelus) are definitely hyperparasites, and at least 2 of the Pimplines (*P[impla] ruficollis* and *P. brevicornis*) are liable to live as hyperparasites under certain conditions. The dominant or 'key' parasites in this complex appear to be the braconid *Orgilus obscurator* and 2 Ophionines, *Cremastus interruptor* and *Omorgus mutabilis*. These were shipped to Canada and the first two have become established there.

"A brief account is given of the salient facts in the biology of each species, and the more important diagnostic characters of the adults are described to facilitate accurate identification, often a very difficult matter. The mature larvae of the commoner species are described in detail, with the particular object of finding satisfactory specific characters. Of the common species the majority attack the larva. *P. examinator* is the only true pupal parasite which is at all common, but *O. mutabilis* and *O. obscurator*, although they are essentially larval parasites, frequently remain in their host and complete their development after it has pupated. Four other species, though normally living as larval parasites, may occasionally emerge from the pupa. One egg parasite, *Trichogramma evanescens*, was recorded.

"None of the common species is confined to *R. buoliana*, and there is no reason to suppose that the other species, about which less is known, are any more specific. Five of the species reared are new to Great Britain and 18 constitute new records for this host."

Controlling the codling moth, A. Spuler (*Better Fruit, 24 (1930), Nos. 8, pp. 5, 6, figs. 3; 9, pp. 5–7, figs. 4*).—This contribution from the Washington Experiment Station reports upon work noted from another source (E. S. R., 63, p. 460).

Oriental fruit moth investigations in Ohio, I, L. A. Stearns and R. B. Neiswander (*Ohio Sta. Bul. 457 (1930), pp. 36, figs. 20*).—The progress of an investigation conducted at Ironton, Lawrence County, from May, 1927, to March 1, 1929, and afterward at Wooster, is reported upon. The first part deals with biological studies, under the headings of infestation, seasonal life history, early seasonal development, adult behavior, larval behavior, and parasitism. The control studies, which follow, are reported upon under the headings of dormant season sprays and hydrated lime in summer sprays.

"Five broods of eggs and larvae were developed in southern Ohio in 1927 and four in 1928 and 1929. Studies of early seasonal development indicate that both pupation and emergence of the spring brood occur from 1 to 2 weeks later

in central Ohio and from 2 to 3 weeks later in northern Ohio than in southern Ohio. The median emergence date for Ottawa County on Lake Erie averages 45.5 days later than that for Lawrence County on the Ohio River, a variation sufficient to account for one brood less of this insect annually in the extreme northern section of the State.

"Behavior studies show that moths are normally most active during the evening, the heaviest oviposition occurring between the hours of 6 and 9. Approximately 95 per cent of the eggs deposited on peach foliage are located on the under surface of the leaves. The length of time required by just-hatched larvae for effecting entry into ripe Jonathan apples averaged 1.25 hours. Very little, if any, of the surface tissue was ingested. Larvae matured most rapidly in peaches, plums, apples, pears, and quinces in the succession named. Apples were superior in every respect as a rearing medium, although the average length of the feeding period in this fruit was 16.7 days as compared with but 13.8 days in the peach, its preferred host."

While the records indicate a larger oriental fruit moth population for the State as a whole at the close of the 1929 season than at any time since its entrance into Ohio, the general conditions of parasitism are considered encouraging. The combined records for 1927, 1928, and 1929, which include rearings from 20 counties, indicate that 16 larval and pupal parasites of this insect are now active in Ohio. Parasitism, in the more important fruit-growing counties in 1929, averaged 15 per cent, with Macrocentrus and Glypta the most effective larval parasites of the fruit moth throughout the area of its distribution in this country, the predominating species in the State as well.

No spray has been discovered as yet which is sufficiently penetrating and toxic to prove effective during the dormant season. "The results of extensive laboratory tests and of both cooperative and experimental orchard spraying emphasize the belief that a probable summer control for this insect will result through a succession of early season sprays which will include hydrated lime or some like material acting as a physical or mechanical hindrance to oviposition, hatching, and larval entry. . . . For the present, the supplementary control measures generally recommended—fall application of paradichlorobenzene, spring cultivation, packing house sanitation, adequate disposal of cull fruit, the separation of early and late varieties of peaches and apples in making new plantings, and moderation in pruning and fertilization—should be adhered to in an endeavor to reduce infestation in so far as may be possible."

Investigations of corn borer control at Monroe, Michigan, A. R. MARSTON and C. B. DIBBLE (*Michigan Sta. Spec. Bul. 204 (1930), pp. 47, figs. 18*).—The agronomic investigations conducted at the Corn Borer Substation in 1926–1929 are reported upon by Marston (pp. 3–29). In planting studies plantings made from May 12 to 25 at Monroe gave the highest yield of mature corn regardless of infestation. Planting in June greatly reduced the borer infestation but resulted in poor yields and immature corn. The heavier corn borer infestation found in early planted corn was apparently due to the greater attraction which the taller and more vigorous corn possesses for corn borer moths, more eggs being deposited and more borers being found in corn of this character.

With the husker-shredder it was found possible to destroy 99 per cent of all corn borers in the corn fodder put through the machine. When the ensilage cutter was adjusted so that the fodder was cut less than 1 in. in length, all corn borers were killed. When corn was passed through a roughage mill, it was so finely ground that not even small portions of corn borers could be found. Topping corn shortly after pollinization had taken place reduced the number of borers remaining in the standing corn, but so greatly reduced the yield of corn that this can not be considered a practical means of lowering corn borer

losses. The planting of a trap strip of corn considerably earlier than the main field was found to offer promise as a means of reducing corn borer losses. Maize Amargo, a very late maturing South American corn, has thus far proved to be markedly resistant to borer attacks. It has been crossed successfully at the station with several strains of Michigan corn.

Entomological investigations at the State Corn Borer Substation in 1927–1929 are reported upon by Dibble (pp. 30–47). In a study made of the emergence of borer moths from the soil, none appeared in trap cages placed in several near-by farm corn fields where cornstalks had been plowed under to a depth of from 6 to 8 in. In a similar experiment where a known number of corn borer larvae were buried in cornstalks in a furrow 8 in. deep, 9.1 per cent of the larvae buried in the fall were recovered in corrugated paper strips at the surface of the ground inside the trap. Of material buried in the spring 39.1 per cent of the buried larvae were recovered in the paper strips. That many borers which are buried by plowing or by other means come to the surface was indicated by the fact that some borers buried to a depth of 4, 6, 8, 12, and 16 in. were recovered in corrugated paper strips placed on the soil surface.

"Studies of egg deposition indicated that the corn borer moths preferred to lay their eggs on the larger and more advanced plants. Some borers were recovered from corn stored in an open crib, emergence of these corn borer moths followed that of field-collected material very closely, being slightly later. The peak of the emergence from the crib came about 10 days later than the peak of general moth flight. The relative attractiveness of corn plants at different stages of development to corn borer moths was studied with an olfactometer. Plants ranging from 24 to 36 in. high seemed to have reached a stage of development which was selected by the borer moths in preference to plants of a smaller or greater size. In a field in which the corn stubbles averaged 9 in. high 9.2 per cent of the total population of borers before harvest were found in the stubble, and 0.4 per cent of the total population were found below the ground."

A comparison made of the attractiveness of corn and mugwort over a period of two years indicated that under the Michigan conditions corn is preferred by the borer, and that mugwort offers no protection against its attack. Counts made in a number of corn fields in southeastern Michigan and growers' estimates of the damage done by the borer show rather severe losses to have been suffered by many farmers in that section of the State in the season of 1929. The most heavily infested field carried a 99.9 per cent infestation and an average borer population of 11 per plant.

It is concluded that the most satisfactory and effective means of controlling the European corn borer now available is the destruction of borer larvae between the time of corn harvest and moth emergence the following spring. It is pointed out that this can be accomplished by (1) low cutting, to take the maximum percentage of borers from the field in the cornstalks; (2) ensiling, shredding, or grinding the stalks; and (3) plowing under, burning, or otherwise destroying all corn stubble, waste, and refuse before June 1.

The utilization of bacteria to destroy the European corn borer [trans. title], S. Métalnikov and V. Chorine (*Ann. Inst. Pasteur, 43 (1929), No. 11, pp. 1391–1395*).—These data are included in an account already noted (E. S. R., 63, p. 849).

A new moth borer of sugar-cane in Argentina (Lepidoptera: Pyralidae), H. E. Box (*Bul. Ent. Research, 21 (1930), No. 3, pp. 307, 308, pl. 1*).—Under the name *Diatraea dyari* n. sp. the author describes a sugercane borer which is of considerable economic importance to the sugarcane industry of the Provinces of Salta and Jujuy, especially the latter, although it does not appear to have

invaded the Province of Tucumán. Notes on its parasites are included. The author's account of earlier observations of this pest in northern Argentina, together with descriptive notes on its early stages, have been noted (E. S. R., 63, p. 256).

Gall midges (Dipt., Cecidomyidae) as enemies of aphids, H. F. Barnes (*Bul. Ent. Research, 20 (1929), No. 4, pp. 433–442*).—Following a brief introduction, this contribution from the Rothamsted Experimental Station deals with the cecidomid species whose larvae are known to attack aphids and those whose larvae presumably feed on aphids, and lists the aphids known to be attacked by cecidomid larvae.

Notes on parasites of the gall-midge (Jatrophobia brasiliensis Rübs.) of cassava in Trinidad, I. H. Myers (*Bul. Ent. Research, 21 (1930), No. 3, pp. 309–313*).—Notes are presented on two chalcids of the genus Aprostocetus, *A. fidius* Gir. and an undetermined species, which attack the gall midge of cassava in Trinidad.

Gall midges (Cecidomyidae) as enemies of the Tingidae, Psyllidae, Aleyrodidae, and Coccidae, H. F. Barnes (*Bul. Ent. Research, 21 (1930), No. 3, pp. 319–329*).—Included in this account are lists of gall midges whose larvae attack Tingidae, Psyllidae, Aleyrodidae, and Coccidae; a list of Psyllidae, Aleyrodidae, and Tingidae known or suspected to be attacked by gall midge larvae; and a list of coccids known or suspected to be attacked by the gall midge larvae.

A new thrips-eating gall midge, Thripsobremia liothripis gen. et sp. n. (Cedidomyidae), H. F. Barnes (*Bul. Ent. Research, 21 (1930), No. 3, pp. 331, 332, fig. 1*).—A contribution from the Rothamsted Experimental Station on a new gall midge which was found predacious on *Liothrips urichi* Karny in Trinidad.

Viability in eggs of Aedes campestris Dyar and Knab (Culicidae), G. A. Mail (*Science, 72 (1930), No. 1859, p. 170*).—The author reports that 25 per cent of the eggs of *A. campestris* deposited in March, 1930, hatched 20 months later when removed from stoppered vials and placed at 22° C. (71.6° F.).

A bot fly from the white-footed mouse, C. W. Johnson (*Psyche, 37 (1930), No. 3, pp. 283, 284*).—*Cuterebra (Bogeria) fontinella* Clark is recorded as having been reared from a larva attacking the white-footed mouse (*Peromyscus leucopus noveboracensis* Fischer) in Massachusetts. Reference is made to the abundance of bots, probably *Oedemagena tarandi* L., on the barren-ground caribou in Labrador, 200 perforations having been counted in a 7 by 10 in. piece from a skin recently tanned.

Biological study of Carabus nemoralis Müll. [trans. title], K. Delkeskamp (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere, 19 (1930), No. 1, pp. 1–58, figs. 40*).—An extended account of this carabid, its life history and habits, with a bibliography of 57 titles.

Fruit tree bark beetle damages orchards, R. H. Pettit (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, p. 86*).—A brief reference is made to the damage caused by the fruit tree bark beetle to peach and cherry orchards.

A biological study of Trichogramma minutum Riley as an egg parasite of the oriental fruit moth, A. Peterson (*U. S. Dept. Agr., Tech. Bul. 215 (1930), pp. 22, figs. 9*).—This bulletin summarizes the most important observations of the life history and habits of *T. minutum*, a common parasite of the eggs of the oriental fruit moth and the codling moth, including the relationship existing between environmental temperatures and the rate of development, made in New Jersey near Riverton in 1927 and near Moorestown in 1928. A few notes on field tests and observations are also recorded.

The author has found that two species or distinct strains of Trichogramma, which will not interbreed, occur in New Jersey, as described in an article previously noted (E. S. R., 63, p. 359). The biological data here presented relate almost exclusively to the form that has lemon-yellow colored females in the summer and is commonly found in many sections of the United States. The parasite was carried through the winter (out of doors) in the eggs of the oriental fruit moth, Mediterranean flour moth, and the common bag worm. Out of doors it emerges early in April, and adults of succeeding generations continue to emerge until November, and occasionally December and January.

In New Jersey there appears to be a maximum of 13 generations. From one to several individuals may develop in the eggs of the oriental fruit moth (1 to 4) and codling moth (1 to 7). Fertilized females produce more females than males, 63 per cent being produced in 1928. Unfertilized females produce males only. Adult parasites live only a few days (1 to 12) during midseason, and they deposit most of their eggs the first day or so if host material is available. One female parasitized as many as 131 eggs; the average for two seasons was 40.2 for 1927 and 35.9 for 1928. Oriental fruit moth and codling moth eggs whose development is two-thirds completed are not susceptible to attack by Trichogramma.

The life cycle of the parasite from egg to adult during summer weather is passed in from 9 to 16 days. "The ratio of change in the life-cycle period at average temperatures of from 60 to 75° F. is approximately 1 day increase or decrease for each 1.25° decrease or increase in the average temperature. For maximum parasite production the temperature should average close to 80°, the humidity should be fairly high, 70 to 80 per cent, an abundant and readily accessible supply of suitable host material should exist, and plenty of artificial light or indirect sunlight should be present. A distinct change in color takes place in the adults, especially the females, when the average outdoor temperature falls below 62°. During warm weather when daily average temperatures exceed 62° the females have a distinct lemon-yellow color, while in the early spring or late fall when daily average temperatures are below 62° the females are distinctly metallic brown.

"Preliminary field tests in a peach orchard indicate that small liberations of from 300 to 1,000 adults per tree are not sufficient to produce parasitism among eggs in adjacent trees."

A list of the known Chinese ants, W. M. Wheeler (*Peking Nat. Hist. Bul., 5 (1930), No. 1, pp. 53–81*).—Here 245 forms are listed. A preliminary list, by Gee, has been noted (E. S. R., 53, p. 656).

ANIMAL PRODUCTION

Inspection of commercial feeding stuffs, 1930, T. G. Phillips, T. O. Smith, and J. C. Fritz (*New Hampshire Sta. Bul. 253 (1930), pp. 51*).—This is the usual report of the guaranteed and found analyses of samples of 351 brands of feeding stuffs collected for official inspection for the year ended May, 1930 (E. S. R., 62, p. 360).

[Experiments with beef cattle at the Eastern Oregon Substation] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 139, 140*).—The results of experiments in continuation of those previously noted (E. S. R., 61, p. 59) are reported.

Growing and wintering beef cows.—Over a period of 6 years cows wintered on a half feed of alfalfa hay averaged 1,090 lbs. in live weight and were 56, 173, 204, and 364 lbs. lighter than similar cows wintered on a full feed of straw and 7 lbs. of alfalfa hay, hay and silage, full feed of hay, and hay and

grain, respectively. The difference in weight was not so apparent at the end of the grazing season as at the beginning. In the better fed groups there was little difference in the growth and development of cows bred to calve at 2 years old and those bred to calve at 3 years, but in the lots on limited feed there was a decided difference in weight in favor of those that produced their first calf at 3 years. A difference of 3 lbs. was found in favor of calves from the better fed lots. Cows calving at 2 years of age were in general the most profitable.

Matured cows in fairly good condition were carried through a winter feeding period of 120 days on straw supplemented with 1 lb. of either cottonseed cake or rolled barley or 8 lbs. of alfalfa hay. Straw alone brought one lot of cows through in fairly good condition. These are all submaintenance rations and are recommended only in cases of emergency. A limited ration of alfalfa hay is deemed probably the most practical and profitable under most conditions.

Baby beef.—Average daily gains of 2.13 and 2.16 lbs. per head were made by calves on ground corn and chopped alfalfa hay and a grain mixture and chopped alfalfa hay, respectively. Calves on rolled wheat gained 1.95 lbs. and those on rolled barley 1.89 lbs. per head daily. The calves receiving rolled barley and long hay gained 1.91 lbs. per head daily and made the most economical gains.

A comparison of ground, chopped, and long hay produced results slightly in favor of the chopped hay. Calves receiving ground alfalfa and a grain mixture gained faster but returned $2.77 less per head than those on a chopped hay ration.

Winter feeding and time of marketing steers, J. C. Grimes (*Alabama Sta. Rpt. 1929, p. 13*).—Continuing this study (E. S. R., 64, p. 163), the results of feeding molasses to steers being finished for spring market were in close agreement with those previously noted.

Steers receiving an average of 4.8 lbs. of cottonseed meal daily on grass while being finished for the June market made an average daily gain of 2.59 lbs. per head at a cost of $4.52 per 100 lbs. of gain and returned a profit above feed cost of $11.19 per head. Similar steers receiving no cottonseed meal gained 2.54 lbs. per head daily at a cost of 86 cts. per 100 lbs. of gain and returned a profit of $17.16 per head above feed cost.

Adding 2.12 lbs. of cottonseed meal daily to a ration of Johnson grass hay increased the rate of gain 0.59 lb. per head daily.

Beef calves use roughage efficiently, G. A. Branaman and G. A. Brown (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 50–53*).—Continuing this study (E. S. R., 63, p. 856), three lots of 10 calves each, averaging approximately 380 lbs. per head, were fed through three periods of 120, 70, and 74 days, respectively. All lots had free access to alfalfa hay and a mineral mixture at all times. Corn silage was fed to all lots until the last 44 days, but for the first four months the amount fed lot 5 was limited. Lot 3 received a limited ration of ground oats the first 120 days, a full feed the next 70 days, and shelled corn the last 74 days. Linseed cake was fed at the rate of about 1 lb. to each 7 lbs. of grain in lots 3 and 4 during the first period and to all lots during the second and third periods. Lot 4 received a small amount of corn during the first period, later increased to a full feed, while lot 5 received no corn the first period, a liberal allowance the second period, and a full feed the third period.

The average daily gains per head in the respective lots were 1.93, 1.39, and 1.14 lbs. during the first period, 2.24, 2.06, and 2.35 lbs. during the second period, and 2.06, 2.46, and 2.65 lbs. during the third period. For the entire period of 264 days the average daily gains were 2.05, 1.9, and 1.9 lbs. per head, respectively. The feed cost per 100 lbs. of gain, after crediting the pork gains,

were cheapest in lot 5 and most expensive in lot 3. Lot 3 graded choice to prime, and lots 4 and 5 good to choice when marketed, but lot 4 was somewhat less uniform than lot 5 and sold at a lower price.

Molasses in ration for fattening calves, P. Gerlaugh (*Ohio Sta. Bul. 463 (1930), p. 13*).—A basal ration consisting of 2 lbs. of a protein supplement, 6.5 lbs. of corn silage, and 1.5 lbs. of mixed hay per head daily was fed to 5 lots of 20 calves each, averaging approximately 371 lbs. per head, for 252 days. In addition, the calves in lot 1 received all the shelled corn they would consume, lot 2 had 2 lbs. of shelled corn replaced by a like amount of cane molasses, lot 3 received 2 lbs. of cane molasses and all the shelled corn they would eat, lot 4 was self-fed molasses in addition to a full feed of corn, and lot 5 received 2 lbs. of beet molasses in addition to all the corn they would eat. Three steers in lot 2 died during the course of the experiment.

The average daily gains in the respective lots were 2, 1.92, 2.12, 2.17, and 2.14 lbs. per head. The 2 lbs. of molasses fed to lot 2 did not replace a like amount of corn. The feeding of either cane or beet mlasses increased the feed consumption. Although self-feeding molasses produced rapid gains and a high selling value, it was an uneconomical practice because of the high feed cost. There was practically no difference in the feeding value of the cane and beet molasses. The calves receiving beet molasses made more efficient gains during the first part and less efficient gains during the latter part of the feeding period than the calves receiving cane molasses. As a substitute for corn, molasses did not increase water consumption, but when used as a supplement to a full feed of corn it stimulated feed consumption and thus increased water consumption.

There were indications that both cane and beet molasses contained a growth factor which played an important part in a long-time feeding period.

Shall I feed calves, yearlings, or two-year-olds? C. C. Culbertson, J. M. Evvard, and W. E. Hammond (*Iowa Sta. Bul. 271, abridged ed. (1930), p. 8, figs. 6*).—A popular edition of the bulletin previously noted (E. S. R., 64, p. 164).

Influence of the animal's age upon the quality and palatability of beef.—I, Carcass yields and quality of meat cuts, M. D. Helser (*Iowa Sta. Bul. 272 (1930), pp. 301–311, 323, figs. 4*).—Continuing this report (E. S. R., 64, p. 164), it was found that more desirable beef was produced by 2-year-old and yearling steers than by calves as both feeders and finished animals. Dressing percentage and cutting yields were higher in finished than in unfinished cattle. Age was not a determining factor in influencing the percentages of the various cuts.

The meat of the calves was lighter in color than that of the yearlings or 2-year-olds. Marbling was more satisfactory in the older than in the younger cattle. The beef of the 2-year-olds and yearlings ripened better than the beef of the calves.

[Experiments with sheep and goats at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 74, 75, 140*).—Continuing these studies (E. S. R., 61, p. 59), several experiments are noted.

Chevon.—Chevon has been found equal in quality and palatability to lamb or mutton of similar age and condition. Since Angora goats mature slowly and do not fatten readily, there are few young goats carrying the same condition as choice lambs.

Economic survey of the Angora goat industry.—Over a period of 3 years it was found that the average cost of producing a pound of mohair on 86 goat ranches was 73.5 cts. No allowance was made for the benefit derived from the clearing of brush by the goats, and most of these goats were kept exclusively for mohair production.

Clearing brush with goats.—Persistent browsing killed out all the more common deciduous shrubs, young trees, and young conifers characteristic of western Oregon. Poison oak was eaten only when feed was short.

Irrigated pastures.—During the season of 1929 irrigated pastures furnished 2,297.6 sheep days per acre and carried an average of 15 sheep per acre. This heavy stocking resulted in severe stomach worm infestation.

Rape for summer pasture.—Rape sown in rows furnished 253 sheep days per acre and 270 sheep days when sown with clover. Although the only satisfactory pasture for lambs during the hot summer months, the yield of rape during this period has been low and the expense of maintaining high.

Spring lamb production in western Oregon.—This study has shown that, with current prices of rent and feed, a farm price of 10 cts. per pound for lambs and 35 cts. per pound for wool is necessary to justify sheep production.

Farm flock management [at the Eastern Oregon Substation].—There was little difference in the winter gains made by ewes fed alfalfa hay supplemented with either grain or silage, nor was there any difference in the birth weights of the lambs. The ewes receiving silage produced slightly more wool. At weaning time the average weight of lambs was in favor of the lot fed alfalfa and grain.

Growing ewe lambs [at the Eastern Oregon Substation].—Ewe lambs fed chopped alfalfa and 0.5 lb. of barley per day were 15 lbs. heavier after 100 days' feeding than similar lambs fed long alfalfa hay without grain. Replacing part of the grain ration with a like amount of molasses retarded the rate of gain.

Ground, chopped, and long alfalfa hay supplemented with 0.25 lb. of barley produced average daily gains of 0.33, 0.22, and 0.17 lb., respectively, during a 120-day period.

The energy metabolism of sheep, E. G. RITZMAN and F. G. BENEDICT (*New Hampshire Sta. Tech. Bul. 43 (1930), pp. 23, figs. 4*).—This is a report of a series of metabolism experiments made in cooperation with the Carnegie Institution of Washington during a period of 10 years. The data combine the results obtained in over 200 separate metabolism experiments through the use of respiration chambers with more than 100 animals. The energy requirements were determined for adult rams, adult ewes, yearling lambs, and suckling lambs. The heat production is presented in relation to surface area based on a formula previously noted (E. S. R., 63, p. 558).

It was found that the energy requirements of growing sheep are greater than those of adult sheep. Since sheep mature earlier than larger domestic animals, their metabolism is high in proportion to the faster growth rate. The respiratory metabolism tests showed that their energy requirements are exceptionally high at birth and during the early part of the suckling period. The requirements then drop rapidly, and by the end of the fourth month reach a level below which there is only a relatively small further decrease, due to advance in age.

The sheep and wool of South Africa, Rhodesia, and Kenya Colony (*Jour. Textile Sci., 3 (1930), No. 3, pp. 61–94, pl. 1, figs. 50*).—The history of the sheep and wool industry in South Africa, together with facts concerning the pastures, rainfall, temperature, fencing, races of sheep, wools and wool qualities, sheep dips, adjustment of races to environment, and the economics of sheep production in this area are presented in this article.

Lamb castration experiment, M. JACOB (*Tennessee Sta. Rpt. 1929, pp. 25, 26*).—In a comparison of methods of castrating lambs, one lot of 45 lambs was castrated with an emasculatome and a second lot of 48 lambs was castrated with the knife. Both lots were docked with a knife, and the altering was done

when the lambs were from 10 to 14 days old. Both lots were similarly handled. The average daily gains were the same in both lots regardless of the method of castrating. A factor in favor of the use of the emasculatome was that it lessened the danger of infection.

[Experiments with swine], J. C. Grimes, W. E. Sewell, and W. C. Taylor (*Alabama Sta. Rpt. 1929, pp. 13–15*).—Studies with swine have been continued (E. S. R., 64, p. 167).

Soybean hay as a supplement to white corn and tankage for growing and fattening hogs.—In this study three lots of 10 pigs each were fed for 84 days on the following rations: Lot 1, white corn and tankage 9:1 self-fed; lot 2; yellow corn and tankage 9:1 self-fed; and lot 3, white corn and tankage 9:1 and soybean hay, both self-fed. The average daily gains were 1.27, 1.47, and 1.6 lbs. per head in the respective lots. The returns per pig above feed cost were $2.30, $2.91, and $3.74 in the respective lots.

Forage crops for fattening hogs.—Continuing this study (E. S. R., 63, p. 662), three lots of 10 pigs each were fed as follows: Lot 1, corn and tankage, self-fed free choice, on oat and Austrian pea pasture; lot 2, corn and tankage 10:1, fed at the rate of 3 per cent live weight, on the same pasture; and lot 3, corn and tankage, self-fed free choice, in dry lot. The average daily gains were 1.65, 1.06, and 1.64 lbs. per head, and the feed required to produce 100 lbs. of gain was 382.1, 258.9, and 404.3 lbs. in the respective lots. The pasture saved 22 lbs. of grain in lot 1 and 146 lbs. in lot 2 for 100 lbs. of pork produced. In this study an acre of pasture was worth $12 when the feeds were self-fed and $26.83 when limited-fed.

Improving scrub hogs by the use of purebred sires.—In this phase of the study the scrub pigs and the pigs that were 50, 75, and 87.5 per cent purebred made average daily gains of 1.03, 1.18, 1.13, and 1.21 lbs. per head, respectively. The feed required to produce 100 lbs. of gain in the respective lots was 441.93, 420.4, 369.5, and 421.72 lbs., while to reach a weight of 200 lbs. it required 228, 203, 207, and 192 days, respectively.

[Experiments with swine at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 75, 76, 140, 141*).—Experiments previously noted (E. S. R., 61, p. 60) are continued in this report.

Preparation of grain.—Fine grinding proved to be the best method of preparing oats and barley when supplemented with tankage, alfalfa meal, and minerals. Steam-rolled barley compared favorably with finely ground barley in everything but cost. Steam-rolled oats increased the feed requirements per pound of gain and decreased the rate of gain as compared with either coarsely or finely ground oats. Lots of pigs fed coarsely or finely ground barley from weaning time to market weight made more rapid and economical gains than pigs on oats to 100 lbs. of live weight and then changed to barley.

Manioc meal.—In two feeding tests manioc meal, a tapioca flour made as a by-product in the manufacture of tapioca and containing about 77 per cent of carbohydrates and 1 per cent of fiber, was fed to pigs. Manioc meal was fed in proportions ranging from one-third to two-thirds of the ration and supplemented with tankage and alfalfa meal, and in one case with molasses. In both tests some of the pigs fed manioc meal made practically no gains. On the basis of these tests it was concluded that manioc meal had about 75 per cent the feeding value of ground barley when the meal composed from one-third to one-half of the ration, and that it was not advisable to use a ration including more than one-third of this meal.

Value of rape pasture in growing and fattening pigs.—Rape pasture, besides increasing the rate of gain, decreased the feed required per 100 lbs. of gain by

amounts varying from 40 to 70 lbs. One acre of rape carried from 15 to 20 pigs on a full grain ration and replaced on the average 727 lbs. of grain.

Effect of water in a pig's ration.—Water in a pig's ration in amounts up to 4 lbs. of water to 1 lb. of gain did not materially affect the rate or economy of gain. The crude fiber content of a ration apparently had a greater influence on the utilization of low-grade wastes than the water content.

Swine management [at the Eastern Oregon Substation].—Sows carried through the winter on a daily ration of 2.5 lbs. of grain made up of equal parts of rolled barley and mill-run and fed leafy alfalfa hay in racks made better gains than sows fed the same grain ration and either ground or chopped alfalfa.

The results in a study of factors influencing the size of litter indicated that sows in thin flesh but thriving at the time of mating produced larger litters than sows carrying an excessive amount of flesh. Sows allowed plenty of exercise during the gestation period produced stronger litters than sows confined in small inclosures.

The use of a protected poultry brooder stove or electric heater has given excellent results for keeping spring pigs warm and away from the danger of being crushed by the sow.

Fattening pigs [at the Eastern Oregon Substation].—Under dry lot conditions cracked peas, rolled wheat, and rolled barley fed to fatten growthy pigs produced average daily gains of 1.92, 1.88, and 1.72 lbs. per head, respectively.

[Experiments with swine], M. JACOB (*Tennessee Sta. Rpt. 1929, pp. 23–25*).—Two studies are briefly noted.

Soft pork feeding experiment.—In this study, three lots of eight pigs each, averaging approximately 111 lbs. per head, were fed for 115 days on the following rations: Lot 1, shelled corn and soybeans, ground and mixed, 12:1; lot 2, shelled corn and soybeans, ground and mixed, 9:1; and lot 3, shelled corn and tankage. All feeds were self-fed, and the pigs had free access to a mineral mixture. The soybeans used were of the Mammoth Yellow variety.

The average daily gains were 0.87, 0.89, and 1.62 lbs. per head in the respective lots. The cheapest gains were made in lot 3 and the most expensive in lot 1. Carcass tests showed that in lot 1, 5 pigs killed medium soft and 3 medium hard; in lot 2, 1 soft, 3 medium soft, and 4 medium hard; and in lot 3, 7 killed hard and 1 died from injury. The average refractive indexes were 1.4604, 1.4604, and 1.4594 in the respective lots.

Swine feeding experiment.—A comparison was made of fish meal and a commercial protein feed as supplements to corn using 2 lots of 19 pigs each, averaging 57 lbs. per head. The pigs were self-fed corn and the protein supplement for 91 days. Pigs fed fish meal made an average daily gain of 1.62 lbs. per head, and the cost of 100 lbs. of gain was $6.66, while in the other lot the gain was 1.54 lbs. per head daily, and each 100 lbs. of gain cost $8.60. The lot fed fish meal consumed about one-third as much protein supplement as the lot receiving the commercial protein feed.

Soft ear corn silage for swine, J. M. EVVARD, C. C. CULBERTSON, Q. W. WALLACE, and E. J. MAYNARD (*Iowa Sta. Bul. 273 (1930), pp. 325–369, figs. 10*).—In an effort to determine the general practicability of feeding soft ear corn silage to hogs, 7 lots of 6 pigs each, averaging about 128 lbs. per head, were fed for 100 days. Tankage and block salt were self-fed in all lots, and, in addition, the respective lots were hand full-fed three times daily No. 4 shelled corn, grade B dried soft ear corn, grade C dried soft ear corn, and soft ear corn silage of grades A, B, C, and D, respectively. The grades of corn were determined in increasing order by the amount of mold, moisture, and rotten spots present

in the ears at husking time. The corn for silage was cut separately into 5 by 14 ft. wooden silos and left there for about 9 months before feeding. At the end of the 100-day period the pigs were all put on a shelled corn, tankage, and salt ration until they reached a final weight of 300 lbs. per head, with a check period of 20 days immediately following the first 100 days.

The average daily gains for the 100-day period were 1.46, 1.72, 1.66, 1.3, 1.03, 1, and 0.87 lbs. per head; for the 120-day period, 1.52, 1.75, 1.78, 1.44, 1.23, 1.18, and 1.04 lbs. per head; and to 300 lbs. of live weight, 1.53, 1.72, 1.68, 1.44, 1.33, 1.3, and 1.21 lbs. per head, respectively. At the close of the 100-day period there was little difference in the tankage and salt requirements and only a slight difference in the corn requirements per unit of gain in the two lots fed dried soft ear corn. The lots fed silage were troubled with digestive disorders, which may have been partially due to the heavy daily consumption of tankage which was from 2.5 to 3.5 times greater than that in the check lot. The corn required per unit of grain in the silage lots was somewhat lower, although not uniformly so, than in the lots fed dried corn.

The number of days required to reach the 300 lbs. of live weight were 113, 100, 103, 120, 129, 134, and 142, respectively. After changing to a shelled corn basis, the pigs gained more rapidly, and this was especially true in the lots that had been fed silage. The shelled and dried ear corn produced gains at about the same cost, but due to the high tankage consumption the silage-fed pigs made rather uneconomical gains. While this test showed that soft ear corn silage may be fed to hogs even during cold weather, the economy of the practice will depend upon the cost of the soft ear corn.

Feeding ensiled versus dried soft ear corn to swine, J. M. Evvard, C. C. Culbertson, Q. W. Wallace, and E. J. Maynard (*Iowa Sta. Bul. 273, abridged ed.* (*1930*), *pp. 8, figs. 9*).—This is a condensed edition of the above bulletin.

Grazing and feeding trials with corn and soybeans for pork production, P. G. Bedenbaugh (*Mississippi Sta. Bul. 283* (*1930*), *pp. 8, fig. 1*).—Concluding the study of the value of soybeans for feeding hogs (E. S. R., 62, p. 63), it was found that grazing Mammoth Yellow beans alone produced satisfactory gains, but that when the beans were supplemented with corn the rate of gain was increased. The latter practice also permitted earlier marketing.

It was observed that Mammoth Yellow beans were more palatable than Laredo beans, and more rapid gains were made with the former in self-feeding or hogging down with corn. When Mammoth Yellow beans and corn were hogged down, pigs made larger gains than when the same feeds were self-fed in dry lot, while the reverse was true of Laredo beans and corn. When corn was supplemented with either variety of beans, the pigs consumed enough beans to aid materially in balancing the corn ration.

In one test a basal ration of corn and Mammoth Yellow beans 6:1 was supplemented with 2 per cent of either Marine Protein feed, dried buttermilk, or cottonseed meal. The average daily gains of the 10 pigs in each lot were 1.48, 1.93, 2.23, and 1.84 lbs. per head, respectively.

Lime in animal production, D. W. May (*Porto Rico Sta. Rpt. 1929, pp. 4, 5*).—Since lime is deficient in some regions of Porto Rico, a series of experiments were conducted with five lots of pigs to determine the influence of a saturated solution of lime in the drinking water on growth. No consistent difference in growth occurred, apparently because not enough lime was held in suspension in the amounts of water drunk. Pigs receiving from 8 to 33 gm. of bone meal per head per day made favorable gains in weight and a good increase in growth for the amount of feed. Even more favorable results were obtained when calcium carbonate was fed at the rate of from 14 to 56 gm. per head per day.

[Experiments with poultry at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 110, 111*).—The results of three experiments are noted.

Effect of feed on egg yolk color.—An experiment with laying hens showed that the amount of green feed fed was a controlling factor in yolk color. Birds having an unlimited supply of green feed produced dark-colored egg yolks. When the amount of kale was limited to 5 lbs. per 100 birds or when alfalfa leaves and blossoms were used to 5 per cent of the mash, a desirable colored yolk was produced without any undesirable effect on health or egg production.

Time of first feed for chicks.—Baby chicks were fed with good results at 24, 48, or 72 hours from time of hatching.

Hopper feeding and litter feeding of layers.—In one test to compare methods of feeding, a lot of Barred Plymouth Rock pullets were fed all their feeds in hoppers, while a similar lot received mash in hoppers and grain fed in the litter morning and afternoon. At the end of nine months there was a profit of 12 cts. per bird in favor of litter feeding.

Factors influencing egg production.—II, The influence of the date of first egg upon maturity and production, C. W. Knox (*Iowa Sta. Research Bul. 128 (1930), pp. 237–252*).—Continuing this study (E. S. R., 63, p. 64), the records of 684 Single Comb White Leghorns compiled over a period of 4 years were used, and the association of the date of first egg with maturity, winter egg production, spring egg production, and annual production was studied. Days to maturity were calculated as the period from the date of hatching to the date the first egg was laid. Winter production was considered as the total number of eggs laid from date of first egg to February 28, while spring production was taken as the number of eggs laid during March, April, May, and June, and total production covered a period of 365 days.

The pullets that laid their first egg early in the laying year were as a rule of earlier sexual maturity than those laying their first egg later in the year. There was a curvilinear association between the time the first egg was laid and winter production. Birds beginning to lay in September had the highest winter production, and those that laid their first egg between September 6 and December 13 produced 50 or more eggs during the winter. Only a slight curvilinear association was found between date of first egg and spring production. Birds beginning to lay in December had the highest spring production, while the poorest production, 58.4 eggs, was among the birds that laid their first egg in March. There was a curvilinear association between date of first egg and annual egg production.

The highest number of eggs, 223.1, was produced by birds laying their first egg in October, and 200 or more eggs were produced by birds laying their first egg from September 6 to December 13.

Problems in egg weighing in relation to production, M. A. Jull (*Poultry Sci., 9 (1930), No. 4, pp. 207–218, fig. 1*).—Concluding this study (E. S. R., 52, p. 675), a point system of scoring the weights of eggs in officially conducted egg-laying contests is suggested. It is also suggested that consideration be given to the differences in market value of different-sized eggs and to the biological value of the problem of the inheritance of egg weight. The data showed definitely that the higher the average egg production per bird the smaller is the mean weight of the eggs produced annually. For determining the approximate mean weight of the annual egg production, the weighing of eggs in grams one day a week may be practiced.

A comparison of egg and body weights of hens, O. S. Willham (*[Oklahoma] Panhandle Sta., Panhandle Bul. 22 (1930), pp. 9–11*).—This is a comparison of the body weights of hens in the Panhandle egg-laying contest and the average weight of their eggs and their per cent production. Similar results are presented for 10 pens of White Leghorn pullets.

Barley substituted for corn in poultry ration, J. M. Moore (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 59–66, figs. 5*).—Continuing the study of barley as a poultry feed (E. S. R., 63, p. 564), two lots of 180 and 200 baby chicks, respectively, were fed the same basal starting mash except that lot 1 received 55 lbs. of ground barley and 5 lbs. of alfalfa leaf meal, while lot 2 received 60 lbs. of ground yellow corn. The alfalfa leaf meal was used to supply the vitamin A lacking in barley. At the beginning of the fifth week a scratch grain containing either barley or corn was added, and the starting mash was changed gradually to a growing mash containing either barley or corn. At 10 weeks the cockerels were removed, and the pullets were continued to 20 weeks of age.

The mortality in both pens was practically the same. When removed at 10 weeks, the cockerels fed barley weighed 86 gm. each more than those fed corn. At 20 weeks of age the pullets fed barley weighed about 192 gm. each more than those fed corn. The birds receiving barley consumed more feed, but the cost of a pound of gain was practically the same in both lots.

Effect of calcium from different sources on the growth and egg production of poultry, O. N. Massengale and C. S. Platt (*Poultry Sci., 9 (1930), No. 4, pp. 240–246*).—In this comparison at the New Jersey Experiment Stations, 5 lots of 50 day-old chicks each were fed the same basal ration. At 10 weeks of age the cockerels were removed, and at 18 weeks the 10 largest pullets in each lot were selected and used to ascertain egg production, percentage of eggshell, shell texture, and weight of eggs produced until the birds were 33 weeks old. In addition to the basal ration, lots 1, 2, 3, and 4 received 1.5 per cent of calcium in the form of oyster shell, limestone, chemically pure calcium carbonate, and precipitated tricalcium phosphate, respectively. Lot 5 received the basal ration only, which contained about 0.2 per cent of calcium.

The birds in lot 3 did not grow as well or produce as many eggs as the birds in either lots 1 or 2, and the percentage of shell was also lower in lot 3. The results indicate that birds are better able to utilize the calcium when fed in the form of oyster shell or limestone than when fed as tricalcium phosphate. On the other hand, the latter supplement was better utilized than the calcium carbonate. The birds in lot 2 appeared to lay heavier and slightly better textured eggs than those in lot 1. The birds in lot 5 developed leg weakness, which disappeared upon the addition of limestone to the ration.

Calcium and phosphorus requirements of the growing chick, G. D. Buckner, J. H. Martin, and W. M. Insko, jr. (*Poultry Sci., 9 (1930), No. 4, pp. 235–238*).—Continuing the study of the mineral requirements of poultry at the Kentucky Experiment Station (E. S. R., 62, p. 255), 6 lots of 20 chicks each were fed the same basal ration to which was added in the respective lots 0, 1, 2, 3, 0, and 0 lb. of limestone and 0, 1, 2, 3, 2, and 3 lbs. of raw bone meal. The chicks were weighed every 2 weeks for a period of 10 weeks. At the end of this period 2 cockerels and 2 pullets from each lot were killed and the calcium and phosphorus content of their femurs, tibias, and fibulas determined.

It was found that the percentages of ash of the leg bones in the chicks and in the dry leg bones were smaller in lot 1 than in the other lots. On the other hand, the percentages of dry bones in the chicks and the percentages of calcium oxide and phosphoric acid in the ash of the leg bones of lot 1 were about the same as in the other lots. The percentages of ash and dry leg bones in the chicks and the percentages of calcium oxide and phosphoric acid in the ash of the leg bones were practically the same in the lots receiving the different amounts of raw bone meal with and without calcium carbonate. These results indicate that raw bone meal is equal to or better than raw bone meal and limestone as a supplement to a ration of yellow corn meal, wheat middlings, and

skim milk when fed in the above-mentioned quantities to growing White Leghorn chicks.

A comparison of shrimp "bran" and two kinds of fish meal when fed at a level of ten per cent in diets for growing chicks, H. W. TITUS, E. McNALLY, and F. C. HILBERG (*Poultry Sci., 9 (1930), No. 4, pp. 219–234, figs. 3*).—The same basal ration was fed to 4 lots of 32 chicks each by the U. S. D. A. Bureau of Animal Industry. To the basal diet was added in the respective lots 10 per cent of North Atlantic fish meal (prepared from the offal of the North Atlantic fishing industry), shrimp bran, menhaden fish meal, and desiccated meat meal. The first 3 lots received 2 per cent of cod-liver oil and the fourth lot 1 per cent. The chicks were weighed first at 2 days of age and then at weekly intervals for 16 weeks.

The results showed that for promoting growth the ration fed lot 4 was the most efficient, the rations fed to lots 1 and 3 about equally efficient, and that fed lot 2 the least efficient. The protein of the menhaden fish meal was of better quality than that of the North Atlantic fish meal, that of shrimp bran was poorer in quality than that of menhaden fish meal, and the protein of the desiccated meat meal superior to that of the North Atlantic fish meal. The time-rate of decrease of the "cumulative efficiency" of the diets in this test was almost constant.

The scientific principles of poultry feeding, E. T. HALNAN ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 7 (1930), pp. VII+26, figs. 2*).—The functions of food, the digestion and digestibility of foods, the physiological considerations of feeding, feeding standards, quantitative requirements, calculation of rations, and notes on feeding stuffs are described in this bulletin with relation to poultry production.

Poultry breeding for egg production, J. S. DUNKERLY ET AL. ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 19 (1930), pp. V+24, figs. 2*).—The results of studies conducted at the County School of Agriculture, Reaseheath, Nantwich, England, on the effect of inbreeding on the stamina and fecundity of poultry are described in this bulletin.

Table poultry production, R. M. WILSON ET AL. ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 18 (1930), pp. V+46, pls. 5, figs. 3*).—The results of investigational work on the production of table poultry, carried on at the South-Eastern Agricultural College, Wye, Kent, England, are reported in this bulletin.

Poultry keeping on the general farm ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 8 (1930), pp. VIII+34, pls. 3*).—In this bulletin suggestions are given relative to the management, feeding, and breeding of poultry and the production of table poultry on the general farm.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 70, 83–86*).—The results of several experiments, some of which are in continuation of those previously noted (E. S. R., 61, p. 65), are reported.

Metabolism experiments with dairy cattle.—Cows fed a ration of alfalfa hay were found to be in negative phosphorus equilibrium in the early lactation period, but when such supplements as disodium phosphate or bone flour were added a positive balance resulted.

Kale v. corn silage for milk production.—The results of four feeding trials show that on the average 1 lb. of corn silage was equal in feeding value to 1.33 lbs. of kale. Replacing half of the corn silage with kale caused no decline in milk production. On the basis of cost of production, yield, and feeding value, 1 acre of kale had a greater return than 2 acres of corn silage. To prevent objectionable flavors in the milk and butter, kale should be fed after milking.

Practical studies with alfalfa hay.—The results of this study indicate no great superiority of eastern Oregon alfalfa over that produced in the Willamette Valley; some value to chopping alfalfa, with the economy of this practice depending upon the cost; uneconomical production on alfalfa hay alone; and economy in feeding succulents and grain mixtures high in phosphorus with alfalfa hay.

Mineral requirements of growing heifers.—In this study there were indications that with animals receiving rations low in minerals more breeding difficulties were encountered than when the rations were higher in minerals and vitamins. There were also indications of a direct relationship between milk and butterfat production and the mineral content of the ration.

Abortion investigations.—In a study of some of the economic losses due to abortion infection, made in cooperation with the department of veterinary medicine, it was found that the useful life of a cow was shortened by at least 20 per cent; that about 30 per cent of the cows that aborted never dropped normal calves again; that the calf crop in a badly infected herd was reduced about 35 per cent; that there was a decline of about 30 per cent in milk production in the lactation following abortion; that there was a decline of 20 per cent of expected production in infected cows; and that from the standpoint of decreased milk yield and loss in productive life, a heifer that aborts her first calf will produce only from 55 to 60 per cent of the return that would be expected had she not become infected.

Skim milk substitutes in calf feeding.—Two calf meals which have been developed as substitutes for skim milk in this study are discussed, together with recommendations for feeding calves these rations.

A study of fungi found in milk, H. A. Cummins, V. C. E. Kennelly, and M. Grimes (*Roy. Dublin Soc. Proc., n. ser., 19 (1929), No. 25, pp. 311–319, pls. 2*).—This is a description of the characteristics and growth habits of fungi found in samples of milk examined by the department of dairy bacteriology, University College, Cork, in connection with a clean milk competition. Many of these species have not previously been reported as having been found in milk.

Anaerobic bacteria in dairy products.—I, Numbers of spores of anaerobic bacteria in milk and cream. II, Relationship of anaerobic bacteria to certain abnormal fermentations, R. V. Hussong and B. W. Hammer (*Jour. Bact., 19 (1930), No. 2, pp. 89–99*).—In studies at the Iowa Experiment Station, spores of anaerobes were found in 15 samples of milk, 27 samples of cream, and 2 samples of condensed sour skim milk. A maximum of 10 spores in 1 cc. and a minimum of 1 spore in 50 cc. were present in the different samples. There was no significant difference in the pasteurized and raw samples, which indicated that pasteurization had no effect upon the spores of anaerobes.

The restraining action of various factors under practical conditions is important in preventing the growth of the anaerobes. The rapid development of acid commonly occurring in milk and cream on holding is preferable to the fermentations produced by some of the anaerobes.

In the second phase of the study instances of abnormal conditions in dairy products produced by the growth of anaerobic bacteria are reported. The organisms most commonly responsible for these conditions were *Clostridium welchii* and types belonging to the group of butyric acid organisms.

Practical introduction to the manufacture and handling of Emmental cheese, A. Peter (*Praktische Anleitung zur Fabrikation und Behandlung des Emmentalerkäses. Bern: K. J. Wyss Erben, 1930, 6. ed., rev. and enl., pp. VIII+122, pls. 15, figs. 4*).—This is a revised edition of the treatise previously noted (E. S. R., 51, p. 877).

VETERINARY MEDICINE

[Biennial report of work in veterinary medicine at the Oregon Station, 1928–1930] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 14, 15, 118–122*).—A brief reference is made to further work (E. S. R., 61, p. 68) with infectious abortion in cattle, which includes the conclusions that have been drawn regarding it. The study of sterility in bulls led to agglutination tests, which indicate that there is no relation between infection with *Brucella abortus* and the occurrence of adhesions of the testes and scrotum. The data obtained indicate that infectious abortion-free cows which retain the fetal membrane usually breed afterward, provided they are treated properly.

In further work with salmon poisoning in dogs (E. S. R., 61, p. 68), it was shown by experimental feeding that the bobcat, house cat, brown bear, and both the eastern and Pacific raccoons may act as carriers of the parasite, although they do not develop symptoms of the disease. With the addition of these hosts to those previously recorded, including the dog, coyote, silver black and blue foxes, and mink (E. S. R., 57, p. 877), it is established that at least one genus of each of the five families of terrestrial carnivorous animals occurring naturally in the State is a host of this parasite.

The results of the studies of liver flukes in sheep and goats (E. S. R., 61, p. 68; 63, p. 673) are briefly summarized.

It is pointed out that a further study of the species of coccidia (E. S. R., 61, p. 68) has resulted in the recognition of six, two of which are new and for which the names *Eimeria praecox* and *E. necatrix* are proposed. Five of these species have been produced in pure culture. "The average size of 50 oocysts of *E. praecox* was found to be 20.6 by 23.8 μ, or a shape index (width divided by length) of 0.87. The oocysts prove infective after 24 to 36 hours sporulation at room temperature. New oocysts appear in the feces on the fourth day after feeding sporulated oocysts, a few hours sooner than with *E. acervulina* (Tyzzer). *E. praecox* attacks the small intestine, beginning near the gizzard. Failure in cross immunization has been established between *E. praecox*, *E. mitis* (Tyzzer), *E. acervulina* (Tyzzer), and *E. maxima* (Tyzzer). *E. necatrix* attacks the small intestine, beginning near the gizzard, and in severe infections produces marked hemorrhages and dilation of the intestine. The schizonts are the largest of any species attacking the duodenum and free portion of the small intestine. The average size of nine schizonts selected from a large number was 49.2 by 63.1 μ, and included a minimum of 42.0 by 44.0 μ and a maximum of 62.7 by 84.7 μ."

The stick method of vaccination for fowl pox developed by Johnson, a description of which has been noted (E. S. R., 62, p. 473), was applied in the vaccination of 92,000 fowls during the summer and fall of 1929.

Tests made during the year of the value of powdered kamala and a colloidal iodine preparation in combating the tapeworm *Davainea proglottina* emphasized the importance of sanitation in preference to treatment with these drugs.

Blackhead disease was found for the first time in the State in the peafowl. Attempts to control this disease by cecal abligation resulted in such a high percentage of mortality as to make its use inadvisable.

The feeding to mature chickens of salamanders, which are common throughout the western part of the State, proved fatal in some instances and relatively harmless in others.

Chemical analysis made of the white muscles found in the bodies of lambs received at the laboratory led to the detection of about 0.9 per cent of calcium present, while normal muscles of the same animal carried 0.12 per cent calcium.

In the treatment of white scours in cattle with a commercial calf scour serum there was some encouragement from its use as a preventive.

Lip and leg ulceration in sheep continued to appear in practically every section of the State, with the heaviest losses in young lambs.

The treatment of sheep parasitized by the stomach worm *Ostertagia circumcincta* with tetrachlorethylene stopped death losses.

Report of the parasitologist, H. L. VAN VOLKENBERG (*Porto Rico Sta. Rpt. 1929, pp. 26–29*).—The fact that a very small percentage of the calves are raised to maturity in Porto Rico is considered to be due principally to parasitic diseases. The successful system employed by the station in combating such parasites consists in keeping the calves in individual, well-drained, and well-ventilated pens for at least the first six months of life. The pens are cleansed daily of all droppings and litter, and the cut grasses are fed from raised racks. Fresh drinking water, salt, and minerals are provided for the animals at all times. During the rainy season the calves under 1 year of age, and those older if necessary, are drenched regularly once each month with a solution of copper sulfate and nicotine sulfate. During the dry season they are drenched every six or eight weeks. Regular treatment of the older calves on pasture gradually lowers the amount of infestation, indicating that the main source of reinfection is from the calves themselves and not from a few of the same kind of parasites that may be harbored by the adult animals. Dipping the cattle regularly about once a month has eliminated the external parasites, especially the ticks and lice.

Liver fluke yearly causes a great economic loss among cattle on the island through weakening the resistance of the animal to diseases, reducing the milk yield and breeding efficiency, and rendering the meat unfit for food, and are often fatal to the animal. Some of the drugs have proved to be efficient after they are repeatedly used, but they can not as yet be recommended for use because of their toxic effect upon the cattle. Goats may be given carbon tetrachloride in doses of 1 cc. per adult animal with safety and with a high efficiency in removing the flukes. Flukes in cattle may be controlled by preventive measures, since this parasite must pass an intermediate stage in the snail which requires either stagnant water, a sluggish stream, or a ditch in which to live and reproduce. The snail is very sensitive to such chemicals as copper sulfate, salt, and lime, a dilution of 1 part copper sulfate to 1,000,000 parts of water killing it in a few hours under laboratory conditions. For Porto Rican conditions the spreading of lime on wet pastures and grasslands is more practicable.

The ova of the swine kidney worm (*Stephanurus dentatus*) were first identified on the twenty-eighth week in the urine of a young pig that had been heavily infested with larvae grown in the laboratory. When slaughtered a few days later many of the worms were found to have reached the ureters of the pig, but apparently only a few were mature. Several of the intermediate forms had not started to migrate through the liver.

The importance of the eradication of the cattle tick on the island is emphasized, it being pointed out that in the last 3 years more than 50 cases of tick fever have been observed by the author, affecting in most instances high-priced animals that had recently been imported from the United States, about one-half of which succumbed. It is estimated that from 25 to 50 per cent of the adult cattle imported from the United States die from the disease, while those that survive are cared for under expensive methods of management on the part of the owners.

[Studies in comparative pathology in Japan] (*Jour. Japan. Soc. Vet. Sci., 9 (1930), Nos. 1, pp. 1–117, pls. 4, figs. 9; 2, pp. 123–181, pl. 1; 3, pp. 197–302,*

pls. 10).—The papers presented in No. 1 include the following: Studies of the Pathogenic Anaerobe—II, Agglutination of the Blackleg Bacillus and the Malignant Edema Organism, by T. Konno and Y. Ochi (pp. 1–15; Ger. abs., pp. 14, 15) (E. S. R., 63, p. 771); Investigations of Swine Pox in Manchuria, with Particular Consideration of the Clinical Condition, by M. Yoshikawa (pp. 16–30; Ger. abs., pp. 27–29); A New Vaccine, "Kapselvaccin," Protective against Strangles, by K. Ogura (pp. 31–36; Japan abs., p. 36); On the Restoration of Conductivity in Abnormal Functioning Nerves, by U. Tanaka (pp. 37–41; Japan. abs., p. 41); Studies on Contagious Pleuropneumonia in Cattle—I, On the Practical Value of Complement Fixation Test Applying the Virus Culture as Antigen in the Diagnosis of Contagious Bovine Pleuropneumonia, by S. Yamagiwa, K. Itabashi, and S. Ito (pp. 42–69; Eng. abs., pp. 67–69); On the Strains of the Glanders Bacillus, by K. Tsuge and T. Toyoshima (pp. 70–79; Eng. abs., p. 79); Contribution to a Knowledge of the Sexual Differentiation of the Common Fowl (Tests with Skin Transplantation), by K. Masui (pp. 80–92; Ger. abs., pp. 89–92); and An Experimental Study on the Virus of Fowl Pest—II, Observations on the Nature of the Virus Passed through Pigeons, by N. Nakamura and Y. Kawamura (pp. 93–117; Japan. abs., pp. 116, 117) (E. S. R., 58, p. 473).

The contributions in No. 2 include the following: On the Poisonous Substances in Liver Bouillon Culture of the Anaerobic Bacillus Isolated from the Chicken Diarrhea, by A. Iizuka (pp. 123–160; Eng. abs., pp. 159, 160); Investigations of the Swine Pox in Manchuria—II, On the Prophylactic Value of Swine Pox and Variola Vaccine and Their Comparative Relation to Immunity, by M. Yoshikawa (pp. 161–168; Ger. abs., pp. 167, 168); and Studies on Contagious Pleuropneumonia in Cattle—II, On the Correlation among the Morbid Changes of Lungs, the Cultivation of Virus, and the Complement Fixation in Cases Naturally Infected, by K. Itabashi, S. Yamagiwa, and S. Ito (pp. 169–181; Eng. abs., pp. 180, 181).

The contributions in No. 3 include the following: Studies on Contagious Pleuropneumonia in Cattle—III, Statistical Observation on Its Prevalence in Inner Mongolia and South Manchuria, by S. Yamagiwa, K. Itabashi, and S. Ito (pp. 197–211; Eng. abs., pp. 210, 211); The Toxicological Investigation in the Toxic Substance Obtained from the Larvae of *Hypoderma* sp. of Mongolian Cattle at the Esophageal Stage, by B. Terada and S. Ono (pp. 212–220; Eng. abs., pp. 219, 220); Comparative Studies of *B[acillus] abortivo-equinus* and *B. paratyphosus* B., by K. Kasai and K. Ogura (pp. 221–242; Eng. abs., pp. 239–242); A New Parasitic Nematode (*Amidostomum anatinum* n. sp.) from Formosan Domestic Duck (pp. 243–248; Eng. abs., pp. 247, 248) and On Some Mallophaga from the Chinese Domestic Fowls (pp. 249–255; Japan. abs., pp. 254, 255), both by M. Sugimoto; On the Outbreak of Blackhead in Japan (pp. 256–263; Eng. abs., p. 263) and a Patho-histological Study on the Testicle Tumor of the Domestic Animals (pp. 264–287; Eng. abs., pp. 286, 287), both by D. Niimi; and A Comparison of Anatomical Changes with Tuberculin Tests in Mongolian Cattle Imported from Dairen, China, by S. Ono (pp. 288–302; Eng. abs., pp. 295–302).

Horsetail a horse-poisoning weed, H. Groh (*Canada Dept. Agr. Circ. 74 (1930), pp. 3, fig. 1*).—A brief practical account.

American type culture collection: Catalogue of cultures, 1927 [and 1928] (*Chicago: John McCormick Inst. Infect. Diseases, 1927, pp. 96; 1928, 2. ed., pp. 142*).—These are the catalogues for 1927 and 1928 of the collection now known as the American Type Culture Collection, which has been maintained since 1925 under the care of a committee representing the societies most interested in its perpetuation.

Experiments with certain reactive factors of Ascaris, H. R. Fishback (*Jour. Infect. Diseases, 47 (1930), No. 4, pp. 345–354, fig. 1*).—This is a report of work conducted with certain active principles of the extracts of powdered Ascaris, including *A. lumbricoides* and *A. suilla*.

"Extracts of Ascaris in different solvents were found to possess a strong but variable hemolytic action on human red blood cells suspended in saline solution. Small doses of serum from young rabbits immunized against Ascaris substance completely inhibited hemolysis by the Ascaris extracts. Uterine strips from sensitized guinea pigs responded specifically to the Ascaris extracts. After incubation with immune serum, the acetone-insoluble, alcohol-soluble extract caused no excitation of the uterine strip, while the saline solution extract was still active. The exciting factor remaining in the latter extract was its protein content. In an allergic human subject the results of intradermal tests with Ascaris extracts were positive. Here also, the reactivity of the acetone-insoluble, alcohol-soluble extract was neutralized by immune serum, while that of the saline solution extract was not diminished. The immune content of the serum thus was specific against the toxin producing hemolysis of red blood cells and against the oxytocic and skin reactive factors of the acetone-insoluble, alcohol-soluble Ascaris extract, but was ineffective against the saline solution extract."

Molds (Aspergillus fumigatus and Absidia ramosa) as causes of abortion in cattle [trans. title]. H. C. Bendixen and N. Plum (*Acta Path. et Microbiol. Scand., 6 (1929), No. 3, pp. 252–322, pls. 6; abs. in Biol. Abs., 4 (1930), No. 7–9, p. 2054*).—Examinations were made by the authors from January to July, 1928, of 17 cases of mycotic abortion in cattle caused partly by *A. fumigatus* and partly by *A. ramosa*, the former having been isolated from 8 cases, the latter from 2 cases, and both from 7 cases.

The growth of Br. abortus in sealed tubes, G. S. Wilson (*Brit. Jour. Expt. Path., 11 (1930), No. 3, pp. 157–163*).—The author has found that recently isolated strains of the bovine type of *Brucella abortus* that are unable to grow aerobically in open tubes develop satisfactorily in the presence of air in tubes that are suitably sealed. Evidence is brought to show that the growth in sealed tubes is due to the presence of carbon dioxide given off by the seal. It is shown that carbon dioxide is produced by flamed cotton-wool plugs, and to less extent by melted paraffin, by sealing wax, and by plain red rubber corks. In tubes sealed with paraffined corks, after preliminary flaming of the cotton-wool plug, the carbon dioxide content of the air over the medium is about 1 to 3 per cent.

Brucella abortus in Porto Rico, P. Morales-Otero (*Porto Rico Jour. Pub. Health and Trop. Med., 6 (1930), No. 1, pp. 3–88, pls. 6, figs. 12*).—The author reports that endemic abortion among cattle, which was recognized for the first time in Porto Rico in 1923, has spread rapidly, and that herds of the northern district are now heavily infected. In spite of the high cattle infection its occurrence in man is very low, only 12 serums having agglutinated out of 1,750 examined.

A bibliography of 80 titles is included.

Abortion-infected herd of cattle studied, C. F. Clark (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 89–91*).—This is a brief summary of data obtained since March, 1926, in studies made of a purebred dairy herd of from 60 to 100 animals of breeding age. The data, which are summarized in tabular form, include the results of the monthly agglutination tests for *Brucella abortus* infection and breeding records that were carefully kept for each animal.

It was found that positive animals had two and one-half times as many abortions as negative animals, and that sterility was four times as frequent in

suspicious animals and eight times as frequent in positive animals as in negative ones. A majority of positive animals, 62 per cent, and an appreciable number of suspicious animals, 11 per cent, had *B. abortus* infected udders. Of animals positive in 1 : 50, 38 per cent became negative, 33 per cent became suspicious, and 28 per cent became positive in a higher dilution. Of animals positive in 1 : 100, 11 per cent became negative, 22 per cent became suspicious, and 67 per cent remained positive. Of the 100 animals studied, only 1 was positive in 1 : 100 more than 3 months and subsequently became negative. No animals studied reacting positively in 1 : 50 or 1 : 100 more than 10 months became and remained negative.

The "tristeza" of bovines (piroplasmosis, babesiellosis, anaplasmosis), J. M. QUEVEDO (*La "Tristeza" de los Bovinos (Piroplasmosis, Babesielosis, Anaplasmosis). Buenos Aires: Jesús Menéndez, 1929, pp. 196, figs. 19*).—An extended account of "tristeza."

Pleomorphic micro-organism associated with acute infectious avian laryngotracheitis, R. GRAHAM, F. THORP, JR., and W. A. JAMES (*Jour. Infect. Diseases, 47 (1930), No. 2, pp. 83–86, fig. 1*).—Studies of avian laryngotracheitis conducted at the Illinois Experiment Station at intervals during a period of seven years have resulted in the isolation of a pleomorphic microorganism from the laryngeal and tracheal exudates of infected fowls in different natural outbreaks of the disease. This organism has been successfully isolated from two fowls in one outbreak coming to the attention of the authors. One fowl from which the pleomorphic microorganism was isolated suffered from the acute type of the disease, while the other was affected with the subacute type. The organism was isolated from the larynx of both fowls by swabbing the inflamed laryngeal mucous membrane with sterile cotton swabs and seeding blood agar plates. It is described as a Gram-positive, hemolytic, nonmotile, nonspore bearing, facultative anaerobe, which requires a blood agar medium for its successful cultivation. Morphologically it has coccoid, diplococcoid, ovoid, granular, or beaded rod forms suggestive of the diphtheroid group.

Subacute or chronic infectious avian laryngotracheitis, R. GRAHAM, F. THORP, JR., and W. A. JAMES (*Jour. Infect. Diseases, 47 (1930), No. 2, pp. 87–91*).—This is an account of the subacute or chronic infectious form of the disease noted above. It has been observed in flocks in which other fowls previously (from 3 to 6 months) suffered from the acute and fatal type of the disease as well as in flocks in which a negligible number of acute cases were simultaneously recognized.

"The subacute type of the disease can be propagated continuously from fowl to fowl by placing a sterile cotton swab in the larynx of an infected fowl and then in the larynx of a healthy fowl. The acute form of the disease can not be continuously transferred from fowl to fowl by laryngeal swabs. By this method of exposure the acute type is transformed into the subacute. The subacute type, by repeated laryngeal transfers, in our experience does not become acute.

"The subacute or chronic type of avian laryngotracheitis has a low mortality in naturally as well as artificially induced cases. Clinically, the disease is characterized by mild intermittent symptoms of a low grade inflammation of the larynx and trachea, which consist of shaking the head and rapid intermittent swallowing, with solitary stenotic laryngotracheal sounds or a continuous 'wheezing' sound. Normal egg production, color of the comb, and appetite are not necessarily altered. Dullness and lack of vigor may be periodically observed in the chronic, subacute type of the disease, followed by emaciation and death.

"A pleomorphic microorganism was isolated from fowls naturally infected with the subacute type, as well as from fowls artificially infected by swabs

from the acute disease. This microorganism is pleomorphic and appears indistinguishable from the pleomorphic microorganism encountered in the acute and fatal form of the disease."

The pathogenicity of a pleomorphic micro-organism isolated from avian laryngotracheitis, R. Graham, F. Thorp, jr., and W. A. James (*Jour. Infect. Diseases, 47 (1930), No. 4, pp. 340–344*).—In work conducted in continuation of that above noted a pleomorphic microorganism with coccoid, ovoid, and granular rods isolated from acute and subacute cases of avian laryngotracheitis was found pathogenic for mature fowls, young chicks, and mice. "Rats, rabbits, and guinea pigs seemed relatively resistant. Approximately 75 per cent of healthy fowls, following laryngeal and postglossal instillation, intravenous injection, and feeding of the microorganism grown on blood agar, developed a mild subacute type of laryngotracheitis characterized by a transitory inflammation of the upper part of the respiratory tract. Approximately one-half of the 90 healthy fowls exposed in this manner (47) displayed mild symptoms.

"The symptoms and lesions in the subacute laryngotracheitis artificially induced by injection of cultures resembled the clinical aspects of the natural subacute disease as well as the syndrome that followed continuous passage of the unaltered laryngeal mucus of naturally acute cases to healthy fowls, but were unlike the symptoms and lesions of the acute, fatal disease. Septicemia and death followed intravenous inoculation of fowls, while suggestive inflammatory laryngeal lesions, including the fresh bloody extravasations in the trachea observed in some natural acute fatal cases, were observed in healthy fowls following intravenous inoculation. Sublethal intravenous doses caused transitory lesions of laryngitis.

"Specific agglutinins were produced in rabbits and horses by repeated subcutaneous injections. Chickens responded in the same manner. The pleomorphic microorganism or its products seemed to possess a selective action for the upper part of the respiratory tract, but is not regarded as a primary etiologic agent of the naturally occurring laryngotracheitis of fowls."

An epidemic disease of domestic fowl caused by a hitherto undescribed organism of the Salmonella pullorum type, W. N. Plastridge and L. F. Rettger (*Jour. Infect. Diseases, 47 (1930), No. 4, pp. 334–339, fig. 1*).—In this contribution from the Connecticut Storrs Experiment Station the authors present a brief report on an epizootic affecting young chicks and adult birds, apparently caused by an organism that is not identical with any that has hitherto been described. The disease was first recognized in the earliest lot of chicks hatched in 1930 on a poultry farm known to be free from *S. pullorum* infection for the past 7 years. Approximately 20 per cent of the chicks in the lot died within the first week, the highest mortality occurring in chicks that were from 1 to 3 weeks old, and the losses varying in the different groups from 5 to 50 per cent. There were very few deaths after the first 3 weeks. Soon after the appearance of the disease in the chicks egg production practically ceased in a pen of 100 adult fowls, and during the following week 10 of the birds in the pen died. In the course of the following 2 weeks egg production gradually increased, and at the time of writing was almost normal.

The morphology, staining properties, cultural characteristics, fermentation, and agglutination reactions of the organism are discussed. Although it attacks the same fermentable substances and possesses essentially the same antigenic and agglutination properties as *S. pullorum*, it differs materially from the well-known pullorum disease organism in morphology, cultural requirements, and virulence for adult birds.

Sodium acid sulphate as a disinfectant against Salmonella pullorum in poultry-yard soils.—A preliminary study, P. W. Allen and M. Jacob (*Ten-*

nessee Sta. Bul. 143 (1930), pp. 14, figs. 3).—This is a report of a study of poultry yard soil as a medium for the spread of pullorum disease commenced in 1927. From a study of 18 samples of infected soil it was concluded that *S. pullorum* may persist in a virulent condition for at least 14 months in both red clay and rich black loams. The organism had completely disappeared from sand by the end of the tenth month.

In a study of the adaptability of standard disinfectants for use on poultry yard soils, cresol compound solution, U. S. P. (3 per cent in water), was effective in ridding the red clay loam poultry yard soil of the organism. The prohibitive cost of this disinfectant led to a study of the efficacy of cheaper materials, of which sodium acid sulfate showed greater efficiency at less expense. In the experimental work conducted poultry were protected against infection with *S. pullorum* from contaminated soil when a 5 per cent solution was applied at the rate of 1 gal. to 1 sq. ft. of soil. No harmful effect upon the hens was observed when used at this rate. The cost and efficacy of sodium acid sulfate makes its use practical as a means of eliminating *S. pullorum* from poultry yard soil. Italian rye grass sown in all of the three lots used in the experiment showed uniformly good growth by midwinter, indicating that a 5 per cent solution of sodium acid sulfate applied to the soil had no detrimental effect upon the growth of this grass. Sodium acid sulfate in 5 per cent solution applied to soil appears to be of value in the control of internal parasites of poultry.

It is pointed out that this disinfectant corrodes metal, is irritating to the skin, and is destructive to cloth. Thus it should be stored and mixed in a wooden or other noncorrosive container, be protected against moisture while held in storage, and handled with care.

The coccidia of fowls in Russia (Union of Socialistic Soviet Republics) [trans. title], W. L. Yakimoff and E. F. Rastégaïeff (*Bul. Soc. Path. Exot., 23 (1930), No. 7, pp. 714, 715*).—In this preliminary note a description is given of the types of coccidia detected by the authors in the excrement of diseased fowls, one of which appears to be *Eimeria tenella* of Railliet and Lucet. Treatment with ichthargan is said to have given encouraging results.

The transmission of avian pox by mosquitoes [trans. title], G. Blanc and J. Caminopetros (*Rev. Gén. Méd. Vét., 39 (1930), No. 464, pp. 456–465, figs. 2*).—This is a more extended account than that noted from another source (E. S. R., 63, p. 775).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Alabama Station] (*Alabama Sta. Rpt. 1929, pp. 19–21*).—Studies by J. W. Randolph of the variation of the lug design factors affecting the traction of tractor wheels showed that the variation of the constants involved appeared to depend largely upon the colloid content of the soil. The results indicate that the general formula for figuring tractive power will hold over a wider range, if changed to include variables depending upon certain soil physical measurements. Lug depth, weight distribution, and lug volume ranked in the same order of importance for the four soils studied. Angle iron lugs which extend some distance beyond a rim will have an average of 11 per cent more traction if the flange is attached to the rim so that they point in a direction opposite to the wheel rotation.

Studies by M. L. Nichols of the friction of soil and metal showed that the increased pull caused by the adhesion of the soil to metal was due largely to the colloid content of the soil. The place in the moisture range of soil at which adhesion took place was affected by both metal and soil. The maximum cohesive power of the soils studied was also found to be in direct proportion to colloid content. A new method of measuring adhesion of soil to metal was

evolved. This consisted of measuring the capillary pull exerted by metal on water, and comparing to this the capillary pull of a metal whose adhesion to soil had been measured by the slider method.

A detailed study of the relation of compaction to pressure for four synthetic soils of known composition showed that compaction for a given force reached a maximum at some definite moisture percentage. This maximum increased as the colloid content increased, probably due to the tendency of the moisture films to form cell-like open structures. This structure appeared to be so constant for the different soils studied that the hypothesis is advanced that there is a normal soil structure for each soil depending upon these forces. Apparently the structure of soils is a function of particle size and is a more constant property than has been generally supposed.

In machinery studies Nichols and E. G. Diseker found that various methods of plowing (including the use of the jointer and coulter), harrowing before the crop was planted, and different systems of bedding had little or no effect on subsequent weed growth, probably due to an unusually wet season. Tests of the rotary hoe, weeder, and drag harrow for reducing the labor of hoeing showed these implements to be entirely unsatisfactory during a wet season on the red Piedmont soils. Experiments with check-rowing corn and cotton showed this method to be practical on sandy, red Piedmont, and Black Belt soils having moderate grades, up to 5 per cent grade. By this method of planting, hoeing was completely eliminated. Thinning cotton planted by this method cost from 40 to 50 cts. per acre.

Experiments with the cylinder disk, or the Wheatland type plow, showed that it is not well adapted to typical Black Belt soils, except where previous cultivation has left the land in good tilth. This was due to its lack of penetration. The plow is entirely satisfactory for sandy or loam soil. It can be operated at a fuel and labor cost of 20 or 30 cts. per acre, and 20 to 25 acres can be plowed per day. It is necessary to have a 15- to 20-h. p. tractor or its equivalent to operate the 8-ft. Wheatland satisfactorily on the sandy or red Piedmont soils tested.

A method of cutting oats and planting peas at the same operation was developed by pulling the binder, Wheatland plow, and grain drill with a 15–30 tractor. The labor and fuel cost was 23 cts. per acre, and the peas were sown two weeks earlier than they could have been if the oats were shocked in the field.

The curing of pea vine hay in the windrow with the side delivery rake was found to be economical of labor and to produce a high quality of hay.

A test of snapping cotton at Decatur showed this method to be applicable to conditions in that vicinity. Savings of from $2 to $4 per bale were shown after a slight loss for grade was deducted. Over one-half the time of gathering was saved. Tests with the new shave plow showed it to be satisfactory for sandy or loose soil, free from rocks, roots, and large gravel. The capacity is approximately twice that of a 12-in. moldboard plow. It can be pulled by two 1,200-lb. mules.

[Agricultural engineering investigations at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1929–30, pp. 73, 75, 113, 124*).—Tests of four different makes of electric water-vapor sterilizers indicated that 175° F. is the minimum sterilizing temperature.

Hay chopping tests with 5- to 10-h. p. motors as the source of power showed that the power required to chop hay and blow it into the barn was 3 to 4.25 kw. hours per ton, and that 1 to 1.5 tons per hour could be chopped with the 5-h. p. motor. In silo-filling tests it was found that the power required to chop and blow silage into the silo was 1.3 kw. hours per ton. Feed grinding tests

indicated that the small hammer mill has been developed to the point that it has many advantages over the small burr mill. The coarse grinding of barley required slightly more power than coarse grinding of oats. Fine grinding of oats required slightly more power, however, than fine grinding of barley. The grinding of corn required less power than for either oats or barley.

The feasibility of supplemental irrigation in the Willamette Valley by use of deep wells was demonstrated by the installation of an 18-in. well, 155 ft. deep, which developed a flow under continuous pumping of 2 cu. ft. per second, or sufficient water to irrigate 160 to 200 acres of land.

Duty of water experiments indicated that the most profitable amounts of irrigation water for use under normal conditions in Harney Valley are for cereals 12 to 14 acre-in.; alfalfa, clover, and field peas, 15 to 18 acre-in.; sunflowers, about 30 acre-in.; and potatoes, 10 to 14 acre-in. In years of extreme drought these figures should be increased about 25 per cent.

[Building materials investigations at the Porto Rico Station], D. W. May (*Porto Rico Sta. Rpt. 1929, p. 3*).—Pisé de terre has been found not to stand up well under Porto Rican climatic conditions. The daily drying and dampening of the air tends to disintegrate the clay, and the driving rains make it difficult to protect the outer surface of the wall.

Continued good results were had with soft limestone or coral deposit, locally known as tosca, when hardened with cement. A mixture of only 1 part cement with 20 parts tosca set quickly and firmly. The surface of the combination may be hardened by brushing with cement in water or with water glass. A mixture of 1 part cement, 10 parts tosca, and 10 parts sand did not make as strong a construction as did the proportion of 1 to 20. The addition of small amounts of gypsum to the cement-lime mixtures increased their strength. The use of the fiber of the coconut husk as a binder reduced the cohesive properties of the mixture. The use of reinforcing irons in the mass was of no value because the mixture would not adhere strongly to them.

Poultry house heater helps egg production, O. E. Robey (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 78–80, figs. 2*).—The conversion of a brooder stove into a poultry house heater is briefly described and illustrated.

Simple burglar alarm protects poultry, O. E. Robey (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 48, 49, fig. 1*).—An electrical burglar alarm for poultry houses is briefly described and illustrated.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics and farm management at the Alabama Station, 1928–29] (*Alabama Sta. Rpt. 1929, pp. 17–19, 24, 25*).—Investigations are reported on as follows:

The relation of the quality of cotton to prices paid to farmers, J. D. Pope (pp. 17–19).—About 5,000 bales of the 1926 crop and 3,500 bales of the 1927 crop were sampled by the station, and a grade and staple estimate of the entire 1928 crop of the State was made by the U. S. Department of Agriculture. These samplings and estimates showed that over 80 per cent, about 95 per cent, and about 93 per cent of the cotton in the respective years was of middling grade or better; 92, 85, and 70 per cent in the respective years was ⅞-in. staple; and about 0.7, 14, and 23 per cent was below ⅞-in. staple. Prices paid in the same local markets on the same day for the same grade and staple often varied as much as $10 per bale, indicating "that cotton is not sold sufficiently accurately according to grade and staple to offer a very strong incentive to the farmer to try to produce better cotton. However, it seems that a farmer is more certain of getting a better price for good grades as compared with poor grades than of getting a premium for good staple as compared with poor staple."

An economic study of poultry in Marshall and DeKalb Counties, Alabama, J. D. Pope and C. G. Garman (p. 19).—The average returns for labor for different types of flocks were from 55 small farm flocks in 1927, averaging 33 hens, $56, and from 82 small farm flocks in 1928, averaging 41 layers, $59; and from 31 commercial flocks in 1927, averaging 130 layers, $205, and from 36 commercial flocks in 1928, averaging 173 layers, $224. The average production per bird was 103 and 73 eggs in the respective years for the farm flocks and 130 and 144 eggs, respectively, for the commercial flocks. The cost of producing eggs was 25 cts. per dozen in 1927 and 26 cts. in 1928. Feed made up 63 per cent of the cost, depreciation of the flocks 15 per cent, and labor 13 per cent. A commercial flock of poultry affects the acreage of cotton a man can tend, since the labor peak is in the spring for both cotton and poultry. The use of 2-horse cultivators was found to reduce the preharvest requirements for labor to 52 man hours per acre as compared with 73 man hours with other methods.

Labor required and cost of producing and storing corn and sorghum silage, J. F. Duggar (pp. 24, 25).—Figures based on 2,090 tons of corn silage and 1,907 tons of sorghum silage in 1928 on 27 fields, the majority of which were in the central prairie section of the State, showed the average labor expenditures and average costs per ton of producing and storing to be for corn silage 0.93 day and $4.86, and for sorghum silage 0.86 day and $3.76.

Cost of oats, J. F. Duggar (p. 25).—Oats resown in January, 1928, on 12 central Alabama farms after the fall sown oats were winterkilled yielded 22.7 bu. per acre at an average cost of 53.7 cts. per bushel.

A bibliography of the history of agriculture in the United States, E. E. Edwards (*U. S. Dept. Agr., Misc. Pub. 84 (1930), pp. IV+307*).—This bibliography is confined, with a few exceptions, to publications issued between 1900 and 1929, and, except in the sections pertaining to agriculture in a strict sense, only the main references are listed. No systematic attempt was made to include items in publications of State departments of agriculture and in agricultural periodicals, or breed books or texts devoted primarily to agricultural methods. The annotations are elucidations of titles and descriptions rather than critical evaluations.

Land utilization and the farm problem, L. C. Gray and O. E. Baker (*U. S. Dept. Agr., Misc. Pub. 97 (1930), pp. VII+54, figs. 43*).—This publication presents graphically "some of the high lights of existing conditions and tendencies in the use of land." Charts, maps, and explanatory text are grouped under the following headings: (1) Some indications of overproduction and maladjustment in production, including charts showing for periods of years the income of persons engaged in agriculture and in nonagricultural industries in the United States, farm prices of farm products, prices of goods purchased by farmers, taxes, and estimated value of farm real estate per acre; (2) some conditions responsible for overproduction and maladjustment in production, covering changes in the acreage of crops in the United States and other countries; changes in agricultural production, in numbers of swine, cattle, and milch cows, in the production of pork, lard, beef, and veal, in number of tractors, horses, and mules on farms in the United States; changes in per capita consumption of food products; and changes in imports of vegetable oils into the United States, and in acreage of crop land required for agricultural exports from the United States; (3) some results of overproduction and maladjustment in production, covering the decrease in acreage of harvested crops, changes in farm population, and examples of farm incomes, delinquent tax sales, and classes of farms in several sections of the United States; (4) outlook for the utilization of land for agriculture, including data as to birth rates in the United States and Europe, yields per acre of different crops in the

United States and Europe, changes in composite yield per acre for corn, wheat, oats, and potatoes, acres required in the United States to produce 1,400,000 calories of certain foods, acreage of land in farms and capable of producing crops, regional soil erosion areas, etc.; (5) outlook for the utilization of land for forests, covering the lumber production, stand of timber, classes and ownership of forest land, public ownership of forest lands, etc.; and (6) land utilization on the public domain.

The effects of the various factors are summarized briefly, but no attempt is made to formulate a concrete or specific policy of land utilization.

Long term loans of Iowa banks, F. L. Garlock (*Iowa Sta. Research Bul. 129 (1930), pp. 253–300, figs. 24*).—This is a study of the question of whether Iowa banks need confine themselves to short-term loans in order to be in position to meet the demands of their creditors. It is based upon data obtained from the reports of officials having supervision of National and State banks, some unpublished data in the office of the State Superintendent of Banking of Iowa, and the records of 20 banks studied by the author. The liabilities of different kinds of Iowa banks for the period 1914–1927 are analyzed, and the measures adopted in meeting demands for payment are examined to determine how important loan collections have been. Such data as are available, principally those obtained from the 20 banks studied, on the term of credits that have been extended are presented.

Deposits, the liability over which the banks have the least control, were found to constitute from 70 to 85 per cent of the total liabilities of the banks. The average extent of deposit withdrawals since 1914 was not found to have been great, and the banks have been able to meet the withdrawals by moderately reducing their loans, cash resources, and securities, and by borrowing small sums from other banks. In the case of occasional extensive withdrawals, banks have allowed their cash resources to be depleted and have borrowed heavily from other banks rather than reduce loans to any great extent.

The average term of bank advances from 1914 to 1916, inclusive, was one year. The turnover of loans was most rapid from 1917 to 1920, inclusive, but fell to a very low rate after 1920. The experience of the period 1914–1927 proved that it is not necessary that loans be confined to short maturities. In actual practice they were not so confined, and very small reductions in loans were made in order to meet the demands of depositors. The rapid increase in the proportion of time deposits since 1920 will permit banks in the future to loan on even longer average maturities than was feasible before the war.

The money income of farm boys in a southern New York dairy region, H. W. Beers (*New York Cornell Sta. Bul. 512 (1930), pp. 55, figs. 11*).—The data for this bulletin were secured by personal interviews in 1929 with members of 232 families having 304 boys, aged 10 to 20 years, inclusive, living at home and not working over half of the time away from home. Tables are presented and discussed showing the amounts and sources of the incomes of the 304 boys; the relation of income to property owned, savings, responsibility for different types of expenses, and attitude toward farming; the work done by the boys and its relation to school advancement; the relation of the economic status of farms, soil type, tenure, and type of farm enterprise to money income and labor of the boys studied; the relationship of parental experience and family characteristics to the income and labor of the boys; and the relation of farm boys to junior extension and the influence of 4-H club work on income, property, and savings. The general facts and trends as shown by the study are as follows:

"(1) In 1929, 300 Chenango and Otsego County farm boys had money incomes which they acquired in ways different from those customary a generation ago. In one year, a year of relative deflation for the dairy farmer, these boys received incomes ranging from nothing to more than $500. Soil productivity and economic status of farms were closely associated with boy income. Village or city birth of parents or nonlocal birth and residence of parents were associated with relatively low boy income. The presence of more than four children at home was another limiting factor. Inheritance of land or its equivalent by the fathers and the age rank of fathers among their brothers were apparently associated with size of boy income, but the relation of parental education was not indicated by the data.

"(2) Most of the money herein referred to as boy income was given unsystematically as spending money. Variations from this most common type of income are associated with age of boys, size of income, 4-H club work, previous village and city residence of parents, and, to a lesser extent, with other factors to which the data refer. The most common types of income other than spending money are, in order, wages earned at home, wages earned away from home, and income from the boys' own property. Only a very few boys received allowances.

"(3) Most of the boys had some property of their own. More than half of them had bank accounts, and nearly one-third of them had life insurance. Size of income was not closely associated with property, but it showed close relationship to savings, insurance, and the presence of bank accounts.

"(4) Older boys and boys with larger incomes tended to be responsible for their own clothing, school expense, and spending money. This responsibility was extended first to clothing, then to school expense, and finally to spending money, probably a reverse of what is found in urban sections. No boys were found who paid for their own room and board, but several were found whose income was partially utilized by parents.

"(5) These dairy farm boys worked more during the school year than did boys previously studied in general farming sections. The amount of work increased with age, as did size of money income. The data of this study suggest, but do not definitely establish, a school retardation associated with farm work done by boys of age 14 and over. The boys on better farms tended to work more than boys on poorer farms. Most of the boys who had left school were boys from poorer farms. Fewer of the boys on better farms worked away from home.

"(6) Social participation of both parents and sons was at a minimum in the area studied. The data were not adequate to establish any relationship of participation either to income or to work done by boys.

"(7) Money income, property, and savings are tangible indexes of junior extension results. In the area studied these factors were augmented without exception by 4-H work. A longer period of membership in 4-H clubs made for greater incomes, more property, and more savings. It is apparent from this study that 4-H club work was one of the most important, if not the most important, factor related to increase in size and to change in source of boy income as compared with the common practices of a generation ago."

Production costs of Michigan beans studied, K. T. Wright (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 43–47, fig. 1*).—A study was made in 1929 in which 133 farmers raising navy beans in 12 counties cooperated. A table is given showing for the farms on different types of soils and the 10 low and the 10 high cost farms, and also for 27 farms growing red kidney beans on 2 types of soil, the average growing and harvesting costs by items, taxes and interest on land, income, yields, hours of man labor and of horse and tractor work, and

other data. The averages, respectively, for the 133 farms growing navy beans, the 10 farms with the lowest cost of production, and the 10 farms with the highest cost of production were as follows: Acres in beans 25.5, 28.1, and 28.1; yield per acre in bushels 12.1, 17.6, and 11.7; total cost of production per acre $36.23, $35.76, and $40.32; income per acre $44.41, $64.15, and $42.39; hours of man labor per acre 23.2, 20.9, and 27.8; hours of horse work per acre 21.6, 18.2, and 24; and hours of tractor work per acre 3.4, 2.5, and 3.4.

The data were studied to determine the effects of the use of green manure, barnyard manure, and commercial fertilizer on yields and costs. On the Brookston soils the cost of production per bushel was found to decrease from $3.35 with a yield of 9.3 bu. per acre to $2.22 with a yield of 18 bu. per acre. On the Miami soils the use of manure and fertilizer caused no apparent increase in yields.

Crops and Markets, [November, 1930] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 11, pp. 425–464, figs. 3*).—The usual tables, graphs, summaries, reports, and notes are included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Survey of land-grant colleges and universities (*U. S. Dept. Int., Off. Ed. Bul. 9 (1930), vols. 1, pp XXVIII+998, figs. 6; 2, pp. IV+921, figs. 25*).—This survey is discussed editorially on page 301 of this issue.

Vocational education in home economics, A. S. BAYLOR (*Fed. Bd. Vocat. Ed. Bul. 151 (1930), pp. VII+166, pl. 1, figs. 19*).—This bulletin gives a résumé of the expansion and development of a national program of vocational education in home economics during the 12 years under the national vocational education acts. The provisions of the Smith-Hughes and George-Reed Acts applicable to home economics, the interpretations of the acts and policies of the Federal Board for Vocational Education, the organization of the work under the Federal acts, the expansion and development of the program of work, and the program of work for negroes are described and discussed. The outstanding achievements in different regions of the United States and the proposed programs under the George-Reed Act are described.

Appendixes include the text of the acts providing for vocational education in the various States and the Territory of Hawaii.

FOODS—HUMAN NUTRITION

Influence of the animal's age upon the quality and palatability of beef.—II, The roast beef, preparation, quality, and palatability, P. M. NELSON, B. LOWE, and M. D. HELSER (*Iowa Sta. Bul. 272 (1930), pp. 311–322, figs. 4*).—The cooking studies reported were undertaken in connection with the studies noted on page 368 as a part of the national cooperative project on factors affecting the quality and palatability of beef. The particular factor under consideration was the effect of age upon palatabilitly, but in addition information was obtained on the effect of the time of aging or ripening of the meat during storage upon palatability and on the relative losses during roasting and the comparative palatability of the roasts from feeder and fattened carcasses. The cooking procedure followed was for the most part that recommended by the subcommittee on cooking of the national committee.

The cooking losses were determined as volatile and dripping losses, including the losses while in the oven and after removal from the oven during the period of standing until the maximum internal temperature had been reached. The average volatile cooking losses for the feeder calves, yearlings, and 2-year-olds were 11.9, 9.7, and 9.4 per cent, respectively, and for the fattened animals 6.5,

7.6, and 8.5 per cent, respectively. The higher volatile losses of the roasts from the calves are interpreted as indicating that the water content of the muscle regulates in part the cooking shrinkage. The smaller volatile losses from the fattened animals are attributed to the layers of fat and the reverse order of amount of volatile losses in the three groups to the greater areas of cut surfaces in the older animals.

The average total cooking losses for the roasts from feeders were 12.5, 11.4, and 10.6 per cent and from the fattened animals 12.7, 13.5, and 15.4 per cent for the calves, yearlings, and 2-year-olds, respectively. The roasts with a high fat content had greater total cooking losses and higher dripping losses than the lean roasts. The two factors considered to have the greatest influence upon cooking losses are total surface area and composition of the meat.

In each case the roasts from the fattened animals required less time per pound for cooking than the roasts from the feeders. In the palatability scores the fattened animals scored higher in total counts than the unfinished ones, although the aroma and flavor of the fat itself did not score as high as in the leaner animals. In texture the roasts from the calves scored slightly higher than from the yearlings or 2-year-olds, but in tenderness there was not much difference. In juiciness the roasts from the 2-year-olds were the most desirable and from the calves the least desirable.

In studying the effect of ripening upon palatability, scores from sixth, seventh, and eighth rib roasts from right and left sides ripened 40 and 60 days, respectively (but with results averaged together) were compared with those from the ninth, tenth, and eleventh rib roasts of the unripened meat. As far as could be judged by this comparison, ripening improved the palatability of the roasts from the fattened calves more than it did the roasts from the yearlings and 2-year-olds. The flavor of the roasts from the calves even after ripening was rather flat and insipid. It is concluded that to produce beef for roasts having the most desirable flavor steers should be at least 20 and preferably 30 months old.

Standards for cooking vegetables in the electric oven, VEN. W. SWARTZ (*Jour. Home Econ.*, *22 (1930), No. 10, p. 861*).—In this study, reported in abstract, the relative efficiency of various oven utensils was tested in standardized electric ovens by determining the time and current required to bring 1,000 gm. of water to 200° F. The utensils tested and times required were cast iron 27 minutes, glass, china, and enamel ware from 29 to 31 minutes, and stainless steel and aluminum from 39 to 55 minutes, with relative efficiencies of 25, 20, and 14 per cent, respectively. Further tests with vegetables baked in china casseroles and aluminum kettles, determining for each the time and amount of water required to secure an attractive, palatable product at temperatures ranging from 250 to 500°, confirmed the preliminary results in that the time required for the aluminum utensils was often from 30 to 45 minutes longer than for the chinaware.

Home pasteurization of milk, L. ARNOLD and C. J. GUSTAFSON (*Amer. Jour. Pub. Health*, *20 (1930), No. 10, pp. 1065–1070*).—A method for the home pasteurization of milk in quart vacuum bottles has been developed in the research laboratories of the Illinois State Department of Public Health. The method consists essentially in heating 1 qt. of milk in an open dish to a temperature of about 145° F. and pouring it into a previously cleaned vacuum bottle heated to the same temperature by means of hot water. Two temperature indicators have been developed to replace the mercury thermometers in testing the temperature of the milk during the heating and after storage in the vacuum bottle. The first is an ampoule of palmitic acid which melts at 145° and the second

one of menthol melting at 108°, the temperature below which the milk is considered unsafe to use. The whole equipment is said to cost less than $3.

Bacterial spoilage of a Thousand Island dressing, C. S. Pederson (*Jour. Bact., 20 (1930), No. 2, pp. 99–106*).—The bacteriological examination of spoiled commercially manufactured Thousand Island dressing revealed the presence of an aerobic spore-former, *Bacillus vulgatus*. On examining the various ingredients used in the manufacture of the dressing, the contaminated organisms were found to come from the pepper and paprika. Boiling these spices for five minutes in vinegar destroyed the organisms.

It is concluded that methods of sterilization of such materials as Thousand Island dressing may be of two types, (1) preparing a product of such acidity that it will not allow the growth of organisms and (2) sterilizing the ingredients containing the contaminating organisms.

The calcium content of the body in relation to that of the food, H. C. Sherman and L. E. Booher (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 1, p. 91*).—In this preliminary report it is stated that chemical analyses of the bodies of large numbers of rats with uniform hereditary and nutritional background and on diets differing only in the content of calcium showed differences in the calcium content proportional to those in the calcium content of their food.

Cereals and mineral metabolism, M. S. Fine (*Cereal Chem., 7 (1930), No 5, pp. 456–465, figs. 4*).—Studies are reported on the growth and bone changes in comparable groups of rats on diets containing 60 per cent whole wheat and 60 per cent oats, respectively, together with dried egg white, starch, Crisco, butterfat, and salts, the only differences among the rations being the proportions of calcium and phosphorus. These were so arranged that the Ca : P ratios were high in one group, approached unity in two, and were very low in another. The two groups receiving calcium and phosphorus in the same ratio also differed from each other in that in one the consumption levels were low and in the other relatively high.

In the wheat series, the growth of the rats in the group receiving a preponderance of calcium over phosphorus was relatively poor. In both of the groups receiving calcium and phosphorus in proportions approaching unity, growth was good. In the final group receiving phosphorus in excess of calcium, growth was better than in the first group but not as good as in the other two. A similar relationship was shown in the oat series, but growth in all cases was poorer than in the wheat series.

The X-ray examinations indicated bone formation in the second and third groups of both the wheat and oats series, while in the first group with disproportionate amounts of calcium and phosphorus there was pronounced development of rickets, which was more severe in the oat than in the wheat group. In the latter group there was also more evidence of spontaneous healing of rickets.

It is concluded that the occurrence and nonoccurrence of rickets on both these diets can be controlled by proper adjustment of Ca : P ratios within wide limits of consumption levels, and that wheat appears to contain more vitamin D than oats.

A new cereal mixture containing vitamins and mineral elements, F. F. Tisdall, T. G. H. Drake, and A. Brown (*Amer. Jour. Diseases Children, 40 (1930), No. 4, pp. 791–799, figs. 7*).—In an effort to supplement the natural deficiencies of cereals, the authors, with the technical assistance of E. McNamara, have prepared a cereal food which is said to furnish the necessary minerals and five of the six known vitamins in appreciable amounts. The mixture is

composed of wheat meal, oat meal, corn meal, bone meal, dried brewery yeast, wheat germ, and alfalfa, all of which are ground together, thoroughly mixed, and dried at a temperature of 70° C. for 30 minutes. Either the wheat germ or the alfalfa is irradiated before being mixed with the rest of the ingredients.

It is stated that 100 gm. (3½ oz.) of the cereal contain as much calcium as 22 oz. of milk, that the iron content is almost twice that of egg yolk, and that copper is present in good concentration, 1.3 mg. per 100 gm. The cereal mixture has been used almost exclusively for three months in the Hospital for Sick Children, Toronto, and has proved to be as palatable as ordinary cereals and to have no laxative or constipating effect.

The problem of dental caries, R. W. BUNTING, F. P. HADLEY, P. JAY, and D. G. HARD (*Amer. Jour. Diseases Children, 40 (1930), No. 3, pp. 536–548, fig. 1*).—This report of preliminary studies on the control of dental caries contains a summary of the various theories which have been advanced concerning the cause of the condition. In the opinion of the authors, based upon their previous studies reported elswhere, dental caries is an infective disease and the specific organism involved is *Bacillus acidophilus*.

The studies reported deal with the relationship of diet and nutrition to the growth and activity of *B. acidophilus* in the mouth and the effectiveness of various prophylactic and therapeutic procedures in the elimination of the organism.

Preliminary dietary surveys in orphanages and children's homes and an experimental study conducted on two groups of institution children showed that a well balanced, well fortified diet in which sugar was reduced to the minimum resulted in the arrest of caries in a large proportion, but not all of the children under investigation. A combination of dietary and therapeutic treatment, the latter consisting in the use of hexylresorcinol as a mouth wash, led to almost complete arrest of caries. Of the two methods, control of the diet was considered to be by far the most effective.

The copper content of beef and hog tissue, A. H. HELLWIG and G. N. QUAM (*Food Indus., 2 (1930), No. 9, p. 411*).—Data obtained by the xanthate method are reported for the copper content of various tissues and organs of fresh beef and hog carcasses. In both cases the liver contained by far the highest amount, 16 mg. per kilogram for beef and 14.5 for hog liver. The kidney ranked next among the edible tissues, with 2.4 and 2.52 mg. per kilogram, respectively, followed closely by the heart, the figures for which were 2.3 and 2.11 mg. per kilogram, respectively.

Physical measurements of one thousand Smith College students, F. F. GORDON (*Amer. Jour. Pub. Health, 20 (1930), No. 9, pp. 963–968*).—The height and weight measurements of 1,000 Smith College students, all of whom entered college between the ages of 16 and 20 years, inclusive, spent 4 years at college, and graduated between 1926 and 1928, inclusive, have been studied particularly with reference to the type of build. Data are tabulated on the median weights with reference to age of the entire group of students at entrance and on graduation, median weights with reference to age and type of build, and median heights with reference to the same factors. The median weights and heights with reference to age have also been compared with previously reported school and college measurements. With one or two exceptions, the median heights of the Smith College students at each age level were greater and the median weights of the intermediate and stocky groups greater than those reported in comparative studies.

The metabolism of obesity.—V, Mechanical efficiency, C. C. WANG, S. STROUSE, and Z. O. MORTON (*Arch. Int. Med., 45 (1930), No. 5, pp. 727–733*).—In

continuation of this series of studies, some of which have been noted previously (E. S. R., 53, p. 60), the mechanical efficiency of obese women has been compared with that of normal and underweight subjects by determining the differences in heat production of the subjects while sitting on a bicycle ergometer and riding on the machine for a short period with a load of about 2.7 kg. at a speed of about 120 revolutions per minute.

A total of 57 experiments was conducted on 27 obese, 9 normal, and 7 underweight subjects. In the obese group the mechanical efficiencies ranged from 15 to 31.3, with an average of 21.7 per cent, in the normal from 21.1 to 27.9, with an average of 24.4 per cent, and in the underweight from 25.5 to 30.9, with an average of 27.6 per cent. A further subdivision of the obese groups showed that the mechanical efficiency varied inversely with the percentage overweight. No relation was noted between mechanical efficiency and the age of the subject.

Vitamin A and carotene.—V, The absence of the liver oil vitamin A from carotene. VI, The conversion of carotene to vitamin A in vivo, T. MOORE (*Biochem. Jour.*, *24* (*1930*), *No. 3, pp. 692–702, figs. 2*).—In continuation of the investigation noted previously (E. S. R., 63, p. 91), two papers are presented.

The first deals with the suggestion made by Dulière, Morton, and Drummond (E. S. R., 63, p. 8) that the presence of effective amounts of vitamin A in carotin might escape spectroscopic detection by reason of the more intense superimposed absorption due to the pigment itself. To answer this, highly purified samples of carotin (m. p. 174 and 178° C.) were compared colorimetically with specimens of cod-liver oil concentrates, and the same materials were tested biologically in doses graded to run parallel to their colorimetric values. In the latter tests the curative method was employed, using dosages below 0.01 mg. daily.

The carotin was found to be effective at levels down to 0.004 mg. per rat per day, while, with the exception of a single rat recovering on 0.002 mg., lower doses were ineffective. The more active of the two cod-liver oil concentrates was effective in curing a single rat at a dosage of 0.0033 mg., but negative results were obtained in all other cases. This would indicate that, weight for weight, the carotin samples were slightly more effective biologically than the cod-liver oil concentrates.

The antimony trichloride color reactions given by the minimal effective doses of the two materials, 0.004 mg. of carotin and 0.0033 of the concentrate were equivalent, respectively, to 0.7 Lovibond blue unit at 590$\mu\mu$ and 0.9 unit at 610 to 630$\mu\mu$. It was concluded that the color reaction of carotin could not possibly conceal any underlying color reaction due to the liver oil vitamin A in amounts which would account for its physiological activity.

The second of the two papers reports more extensive evidence along the lines noted in a preliminary report (E. S. R., 62, p. 492) in support of the view that carotin is the precursor from which vitamin A is formed in the living body. The liver oils of rats depleted of their store of vitamin A invariably gave negative results when tested with the antimony trichloride color reagent. Rats depleted of vitamin A were cured by the administration of a large excess of carotin purified by 12 crystallizations from cyclohexane, of red palm oil, and of fresh carrots. Examination of the liver oils of these rats showed traces of yellow pigment, but the predominant chromogen present, as determined both colorimetrically and spectrographically, was vitamin A. The antimony trichloride reaction was strongly positive and showed a marked band at 610 to 630$\mu\mu$ and not at 590$\mu\mu$, the position characteristic of the ingested carotin.

The details of the conversion of carotin into vitamin A are summarized as follows:

Carotene →	Vitamin A
Synthesized in plant	Stored in animal
Intensely yellow	Almost colorless
328$\mu\mu$ absorption band absent	328$\mu\mu$ absorption band developed
Greenish blue $SbCl_3$ reaction at 590$\mu\mu$	Vivid blue $SbCl_3$ reaction at 610–630$\mu\mu$

In discussing the significance of this evidence, the author emphasizes the fact that since carotin and the liver oil vitamin A both give positive results when tested biologically it is unavoidable that colorimetric methods should be used in studying the conversion of one into the other. It is noted that the natural yellow color of carotin in chloroform solution compared with the blue color formed when it is dissolved in the same volume of the antimony trichloride reagent has a yellow to blue ratio of about 11 to 1, while the faintly yellow color of a cod-liver oil concentrate compared with the intensely blue color of its antimony trichloride reaction has a corresponding ratio of about 1 to 100. "Thus when one constituent is present in a given material in predominant amount, the yellow to blue ratio suggests at once whether this constituent is a carotinoid or the almost colorless vitamin, while in the case of equal mixtures a rough working approximation as to the probable proportion is afforded."

Studies of the vitamin B complex and pathological conditions associated with the lack of vitamin B complex, W. D. Salmon, N. B. Guerrant, and S. J. Schilling (*Alabama Sta. Rpt. 1929, pp. 16, 17*).—This is a brief progress report of attempts to separate and concentrate the two hypothetical substances suggested in a previous report (E. S. R., 60, p. 596) as possibly being present in what had previously been considered to be the pellagra-preventive (P-P or G) fraction of vitamin B.

As in the previous study, an extract of kudzu leaves was used as the starting material. This was treated with an excess of lead acetate at a slightly alkaline reaction and the precipitate, after removal of the lead, treated with acid alcohol. The alcohol-soluble portion was very effective in its antiseptic action against the Gram-positive cocci obtained from the skin lesions of pellagrous rats, but did not support growth in rats on a vitamin B-free diet supplemented by the standard B-P solid, nor was it potent in preventing the occurrence of skin lesions on such diets either by feeding or injection.

The filtrate from the lead acetate precipitate was very weak in its antiseptic action, but fairly potent in supporting growth when used as a supplement to the vitamin B-free diet plus the standard B-P solid. On this diet, however, severe skin lesions eventually developed, following which growth ceased.

Studies on the antiseptic action of some known chemical compounds upon the cocci obtained from the skin lesions showed gentian violet to be extremely effective, catechol, gallic acid, pyrogallol, and hydroquinine less effective, and tannic acid, resorcinol, phenol, and phloroglucinol still less effective in decreasing order. The phenol crystals were less effective in their antiseptic action than some of the fractions prepared from kudzu leaves. Gentian violet, though extremely antiseptic in vitro, had no effect in vivo. Attempts to produce the characteristic skin lesions by transfer from pure cultures of staphylococcus isolated from skin lesions to lacerated areas of skin on other rats in various stages of depletion were uniformly unsuccessful. The injection of the organisms by various methods occasionally produced local reactions, but never generalized lesions to any greater extent than those occurring spontaneously.

The addition of yeast or whole milk to the diet of pellagrous rats caused rapid improvement in the general condition, but very little effect upon the skin lesions.

Studies on vitamin C.—I, On the occurrence of vitamin C in celery. II, III, The production of vitamin C by germination, T. MATSUOKA (*Mem. Col Agr., Kyoto Imp. Univ., No. 9 (1930), Arts. 1, pp. 1–13, figs. 6; 2, pp. 15–21, figs 2; 3, pp. 23–27, figs. 2*).—In the first of these three papers the basal vitamin C-free ration and general technic are described, and data are presented indicating that celery of the Golden Self Blanching variety is capable of preventing scurvy and promoting growth at a fairly good rate in amounts of 1 to 2 gm. per day per 100 gm. body weight. According to the author's experience with other materials, this indicates that the "vitamin C potency of the celery cultivated in Japan is equal to that of lemon or orange or radish juice." Radish juice was used in place of orange juice as the source of vitamin C for positive controls, the customary dosage being 10 gm. of the whole radish or 10 cc. of the juice.

The second paper reports the results of feeding as the sole source of vitamin C dry rice seeds and rice soaked in water for 24 hours in the dark. A small amount of vitamin C was demonstrated in the rice, but no increase during germination.

The third paper reports the results of testing for vitamin C rice, barley, and oat seeds germinated in the sunlight for three days. Of the first two materials an amount of 2.5 gm. daily per 100 gm. body weight proved sufficient, but this was not the case with the germinated oats. Larger amounts were not tested, however.

The occurrence of vitamin C in two varieties of potatoes grown under similar conditions, J. E. RICHARDSON, D. DOUGLASS, and H. MAYFIELD (*Potato Assoc. Amer. Proc., 16 (1929–30), pp. 69–73, fig. 1*).—Determinations of the vitamin C content of Netted Gem and Bliss Triumph potatoes grown under similar conditions on irrigated land in Gallatin Valley, Mont., are reported from the Montana Experiment Station.

When fed raw, 5 and 10 gm. of the Bliss Triumph potatoes furnished better protection to guinea pigs against scurvy than equivalent amounts of the Netted Gem potatoes. *After the potatoes had been boiled for 25 minutes, those of the* Bliss Triumph variety showed a loss and of the Netted Gem a gain in antiscorbutic properties, so that cooked Netted Gem potatoes thus ranked higher than cooked Bliss Triumph potatoes as a source of vitamin C.

The only suggestion in explanation of these findings is based upon the fact that the Netted Gem potato has a deeper yellowish green color and a slightly more acrid flavor than the Bliss Triumph. It is suggested that a compound is present in the raw Netted Gem potato which has an inhibiting action on Vitamin C but which volatilizes on heating, thus releasing the full activity of the vitamin, while in the Bliss Triumph no inhibitor is present and the vitamin is directly affected by oxidative processes on cooking.

Vitamin D and the antirachitic activation of foods by irradiation with ultra-violet light, F. L. GUNDERSON (*Cereal Chem., 7 (1930), No. 5, pp. 449–455, fig. 1*).—This is a general discussion of the subject, with particular emphasis on methods of determining the antirachitic potency of foods.

Viosterol (irradiated ergosterol): Prophylactic and therapeutic dosage, J. H. HESS, H. G. PONCHER, M. I. DALE, and R. I. KLEIN (*Jour. Amer. Med. Assoc., 95 (1930), No. 5, pp. 316–323*).—This is the report of an extensive clinical investigation, extending from November 1, 1928, to December 1, 1929, of a biologically standardized preparation of irradiated ergosterol to determine (1)

the amount necessary to prevent rickets in infants during the first year of life when its administration is started within the first week, (2) the therapeutic dosage for rickets, (3) the possible development of toxic symtoms from overdosage, and (4) the possible advantages to be gained by feeding vitamin A in addition to vitamin D.

The subjects were for the most part babies born in the hospital of mothers who had been under supervision in the prenatal clinic. The babies were observed at a special clinic twice a month for the first six months and once a month thereafter. At one month of age each child was put into one of three groups receiving viosterol, cod-liver oil, and no antirachitic agent, respectively. The feeding otherwise was as in private practice—breast feeding if possible, otherwise breast feeding with additions or artificial feeding alone, with suitable changes at proper ages and weaning at nine months. The observations included monthly Röntgenograms of the chest and both wrists and periodic determinations of blood serum calcium, phosphorus, and potassium. In the prophylactic studies, nearly 100 babies were included in the entire series of observations. In addition several cases of florid rickets were studied.

From the many observations made in the prophylactic series, the authors conclude that "for the average normal infant from birth to one year of age, under varied environmental and seasonal conditions, in the temperate zone, 10 drops of viosterol in oil a day is the minimum dose for prophylaxis. It should be started during the first weeks of life." No definite conclusion was drawn concerning the optimum therapeutic dose on account of the small group observed and the many variable factors involved. In some cases healing took place on from 10 to 15 drops of viosterol in oil daily and uniformly on 30, 40, 50, and 60 drops daily. The average time required for healing as determined by Röntgenograms was about 28 days.

Toxic symptoms were not observed in any of the babies during the period of investigation. No important differences were noted between the effect of cod-liver oil, furnishing vitamins A and D, and viosterol furnishing D alone.

Newer aspects of the therapeutics of viosterol (irradiated ergosterol), A. F. Hess, J. M. Lewis, and H. Rivkin (*Jour. Amer. Med. Assoc., 94 (1930), No. 24, pp. 1885–1889*).—The principal points brought out in this continuation of the authors' observations on their clinical experience in the use of irradiated ergosterol (E. S. R., 62, p. 590) have been noted elsewhere, namely, that rickets may be associated with normal concentrations of phosphorus in the blood (see p. 398) and that the effects of irradiated ergosterol and cod-liver oil are not always comparable (E. S. R., 63, p. 297).

In the opinion of the authors "the present method of standardizing viosterol on the basis of 'cod-liver oil units' is founded on the false premise that the action of cod-liver oil and of viosterol is the same in infants as in rats. A better method would be to compute the potency directly either as protective or as curative 'rat units.' The dosage of viosterol should be increased from two and a half to three times. This can best be accomplished by increasing the strength of the solution."

The absorption and excretion of calcium and phosphorus by rats receiving excessive doses of irradiated ergosterol, E. Watchorn (*Biochem. Jour., 24 (1930), No. 3, pp. 631–640, figs. 2*).—In the introduction to this paper reference is given briefly to the two theories which have been advanced to explain the source of the extra calcium present in the blood and certain tissues following excessive intake of irradiated ergosterol—(1) that there is increased absorption from the intestines with increased retention, and (2) that the calcium in the bones is the source of hypercalcemia and deposition in other tissues. In

an effort to throw more light on the subject, the author conducted total calcium and phosphorus metabolism experiments on rats, together with a detailed study of urinary calcium in preliminary, excessively irradiated ergosterol, and curative periods. In determining the calcium in the urine, the method of Shohl and Pedley (E. S. R., 47, p. 109) and in the feces that of McCrudden (E. S. R., 23, p. 9) were followed, with slight modifications which are described in detail.

The urinary calcium figures showed a marked increase as the result of massive doses of irradiated ergosterol, but with no increase in phosphorus excretion. The fecal content of both calcium and phosphorus decreased, the former to a marked extent, but not always in proportion to the intake. During the recovery period the fecal calcium tended to be very high and the phosphorus also higher than normal. Averaged for the whole period of irradiated ergosterol administration the calcium balances were never negative, but were materially reduced by the hypervitaminosis, as was also the case with phosphorus.

It is pointed out that "whatever the effect of irradiated ergosterol may be on absorption, it is clear that the hypercalcemia and calcification of various tissues is not due entirely, if at all, to increased absorption, since the amounts retained in the body are less than is normally the case. The source of this calcium must be looked for elsewhere, and unlikely as it appears a priori that the action of large doses of a substance which normally aids calcification of the bones should be in the reverse direction, yet it is difficult to see where the deposited calcium comes from if not from the bones."

The phosphorus distribution in blood and the calcium and phosphorus excretion during hypervitaminosis D, C. A. Ashford (*Biochem. Jour.*, 24 (1930), No. 3, pp. 661–668, figs. 3).—Studies of the distribution of organic acid-soluble phosphorus compounds in the blood of rabbits receiving excessive doses of irradiated ergosterol showed no change in distribution accompanying the increase in inorganic phosphorus of the blood. The values for serum calcium were higher than normal during the hypervitaminosis. Urinary calcium and inorganic phosphate were both increased, the former to a marked degree. During recovery, the urinary values for both substances remained high after other symptoms had entirely disappeared. Commenting upon the two theories noted above to account for the origin of the increased calcium and inorganic phosphorus of the blood, the author notes that histological examination of the bones of the rabbits of the present study showed them to be hard and well calcified, which would hardly suggest that the calcium came from the bones.

Association of keratomalacia with other deficiency diseases, A. A. Weech (*Amer. Jour. Diseases Children*, 39 (1930), No. 6, pp. 1153–1166, figs. 2).—This contribution from the division of pediatrics of the department of medicine of Peiping Union Medical College reports observations on 13 children under 3½ years of age suffering from xerophthalmia, the principal object of the investigation being to determine what other deficiency diseases might be associated with that of vitamin A.

Two of the 10 children examined for rickets were found to have active rickets, 3 healing rickets, and 5 no rickets. In the author's opinion the absence of rickets and signs of healing rickets are attributable to the exposure to sunlight, which is made possible by the living habits of the inhabitants of northern China. No definite association between keratomalacia and either beriberi or scurvy was found. In commenting upon this, it is noted that beriberi is not a rare disease in northern China but is observed far less frequently than either keratomalacia or rickets, and that infantile scurvy is almost never encountered. Freedom from scurvy is attributed chiefly to the

abundant use of cabbage in some form, as noted by Tso (E. S. R., 61, p. 193). Five of the 13 children showed evidence of edema, but this was considered to be a manifestation of some other dietary defect than lack of vitamin A. Four of the children showed hemoglobin values of less than 70 per cent of normal, but no conclusion was drawn concerning the cause of these low values. It is noted in conclusion that the general nutrition of all of the children under investigation was far below normal.

The lack of relationship between the development and cure of rickets and the inorganic phosphorus concentration of the blood, A. F. Hess, M. Weinstock, H. Rivkin, and J. Gross (*Jour. Biol. Chem.*, *87* (*1930*), *No. 1*, *pp. 37–46*).—This paper reports in greater detail the experimental evidence noted in preliminary reports (E. S. R., 62, p. 694; 63, p. 296) leading to the conclusion that rickets may be associated with normal concentrations of inorganic phosphorus in the blood, and that "*in addition to the systematic disturbance which is characteristic of rickets, there is probably a local disturbance at the epiphyses which prevents the anchorage of calcium and phosphorus in the cartilage and in the bones.*"

Metabolism and treatment of osteomalacia: Its relation to rickets, S. L. Gargill, D. R. Gilligan, and H. L. Blumgart (*Arch. Int. Med.*, *45* (*1930*), *No. 6*, *pp. 879–907*, *figs 7*).—This paper consists chiefly of a detailed report of the symptoms, treatment, and metabolic findings of a case of advanced osteomalacia in a young woman. At the beginning of hospitalization, in spite of having taken 30 cc. of fresh unrefined cod-liver oil on alternate days for 6 months, the patient had an average calcium balance of —45 mg. per kilogram body weight. There was no improvement following the ingestion daily of 50 cc. of a physiologically tested preparation of cod-liver oil, but definite improvement when a cod-liver oil concentrate containing large amounts of vitamins A and D was substituted and still more marked improvement when ultra-violet irradiation was added to the treatment. This caused deposits of considerable amounts of calcium and phosphorus, together with increased density in the bones and striking clinical improvement. The storage of calcium and phosphorus was further increased to a marked extent by the administration of large amounts of these elements in the form of calcium lactate and disodium acid phosphate. Maximum retention occurred when increased amounts of both elements were fed simultaneously.

"The clinical, metabolic, blood, and Röntgen observations, together with the striking retention of calcium and phosphorus when ultra-violet light and vitamins A and B were given, lead us to believe that osteomalacia as manifested by this patient is a form of adult rickets."

Loss of actinic intensity in urban sunshine due to air pollution, F. O. Tonney, G. L. Hoeft, and P. P. Somers (*Jour. Prev. Med.*, *4* (*1930*), *No. 2*, *pp. 139–148*, *figs. 9*).—To determine the loss of actinic intensity in the sunshine in Chicago from air pollution, simultaneous measurements by the methods described previously (E. S. R., 61, p. 697) were made in four different sections of the city and in several points located to the windward of the city at a sufficient distance to assure relative freedom from dust and smoke. The tests were made at hourly intervals two or more days per month from May, 1926, to August, 1929, inclusive.

Material loss of the ultra-violet intensity available at the clear points was demonstrated in all the city districts tested at all seasons of the year. The percentage losses were greatest in the warm months when the concentration of the shorter ultra-violet rays was greatest, although the lowest absolute intensities were observed in the cold months when only the longer rays of the

ultra-violet region were present in significant amounts. The loss of ultra-violet light was relatively less in the lake shore districts than in those farther inland. Readings taken from a 450-ft. tower were generally higher than those at street levels during the season of greatest density of smoke.

"The high percentage of loss of short ultra-violet waves in summer, the season of minimum smoke production, suggests that the improvement to be expected from smoke abatement methods applicable to existing combustion processes will not in reality solve the problem, and seems to justify the view that the general substitution of electric energy for combustion processes as a source of heat, light, and power is the logical ultimate solution."

MISCELLANEOUS

Methods of correlation analysis, M. EZEKIEL (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, pp. XIV+427, figs. 74*).—The book deals entirely with an analysis of the relations between variables, including explanations of the methods employed and examples of how the methods may be applied to different groups of data.

Fortieth Annual Report [of Alabama Station, 1929], M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1929, pp. 37*).—This contains the organization list and a report on the work and publication of the station for the fiscal year ended June 30, 1929. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Director's Biennial Report [Oregon Station], 1928–1930, J. T. JARDINE (*Oregon Sta. Bien. Rpt. 1929–30, pp. 143*).—This contains the organization list and a report of the director for the biennium ended June 30, 1930, including synopses of departmental reports and notes on the substations. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Porto Rico Agricultural Experiment Station, 1929, D. W. MAY ET AL. (*Porto Rico Sta. Rpt. 1929, pp. [2]+29, figs. 7*).—This contains the organization list, a report of the director as to the general conditions and lines of work conducted at the station during the year, and reports of the assistant chemist, horticulturist, plant breeder, agriculturist, plant pathologist, and parasitologist. The experimental work is for the most part abstracted elsewhere in this issue.

Forty-second Annual Report [of Tennessee Station], 1929, C. A. MOOERS ET AL. (*Tennessee Sta. Rpt. 1929, pp. 53, fig. 1*).—This contains the organization list, an account of the work of the station, and a financial statement as to the Federal funds for the fiscal year ended June 30, 1929. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [November, 1930], edited by V. R. GARDNER and A. J. PATCH (*Michigan Sta. Quart. Bul., 13 (1930), No. 2, pp. 41–102, figs. 14*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Yields of Commercial Wheat Varieties Tested, by H. C. Rather and C. P. Wilsie (pp. 72–76); Bacteria May Cause Bad Flavor in Butter, by E. D. Devereux (pp. 76, 77); Eighth Michigan Egg Laying Contest Closes, by E. S. Weisner (pp. 81, 82); and Michigan Has Record Small Grain Crops, by P. R. Miller (p. 83–85).

NOTES

Connecticut College and Storrs Station.—The inauguration of Dr. Charles Chester McCracken as president will take place next June in connection with the celebration of the fiftieth anniversary of the college. The principal address will be made by Dr. W. O. Thompson, president emeritus of Ohio State University.

Dr. J. L. Hypes, professor of sociology and chief of rural sociology in the station, has been granted a year's leave of absence to accept an appointment as a member of the staff of the Social and Religious Institute, which is studying conditions in India. Elizabeth V. W. Clapp, in charge of home economics research, has been granted leave for the current year to be spent at the University of Chicago. Dr. Victor A. Rapport has been appointed assistant sociologist vice Carroll D. Clark, resigned to become professor of sociology at the University of Kansas. Wilma B. Beckman has been appointed research assistant in the department of home economics research; Dr. Erwin Jungherr, animal pathologist; and Dr. George B. Clarke, assistant economist.

Rutgers University and New Jersey Stations.—William C. Skelley, associate professor of animal husbandry and assistant animal husbandman, has been appointed professor of animal husbandry and animal husbandman, beginning January 1, vice Frank G. Helyar, who will devote his entire attention as director of resident teaching.

Cornell University.—Dr. Floyd K. Richtmyer, professor of physics since 1918, has been appointed dean of the graduate school vice Dr. R. A. Emerson, whose term of office has expired.

Ohio Station.—The death in 1930 is noted of W. K. Greenbank, editor, and the resignations of L. M. Ames and Grace Brinton, assistants in botany and plant pathology and home economics, respectively. Recent appointments include Dr. Richard Bradfield as associate and J. C. Carroll as assistant in agronomy, Dr. R. E. Rebrassier as associate and David F. Bent, jr., as assistant in animal industry, L. J. Alexander and Thelma Alexander as assistants in botany and plant pathology, C. E. Knoop and R. G. Washburn as assistants in dairy industry, M. A. Vogel as assistant in entomology, John H. Hawkins as assistant in forestry, Marion E. Griffith as assistant in home economics, Dr. H. D. Brown and Alex Laurie as associates and H. C. Esper as assistant in horticulture, and R. E. Sherman and Dr. W. B. Stout as assistants in rural economics.

Washington College and Station.—*School and Society* notes that the board of regents has filed a test suit to determine the validity of a recent opinion by an assistant attorney general of the State that legislative appropriations are necessary biennially and in specific amounts to authorize the disbursement of any official funds reaching the State treasury. This opinion includes in such funds the several Federal grants for education, research, and extension and various local funds such as student fees and receipts from the sale of farm products.

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EDITORIAL

RESEARCH AND THE REPORT OF THE SURVEY OF THE LAND-GRANT COLLEGES AND UNIVERSITIES

The report of the survey of the land-grant colleges and universities, reviewed in these columns last month, devotes 125 of its approximately 2,000 pages to a section on research. This allotment is manifestly much too small for a full consideration of the status, achievements, and problems of the comprehensive and complex system of agricultural experiment stations, and while it is substantially equivalent to the assignment for agricultural extension, in neither case was there opportunity for so detailed a treatment as was accorded various phases of resident instruction, with which the report is very naturally largely concerned. Consequently the reader of the section must not expect an exhaustive discussion of the many matters in which the stations are collectively concerned. What has been attempted has evidently been as effective a utilization as possible of the space available for a presentation of some of the more important findings developed by the inquiry and an expression of current opinion on various outstanding problems. These functions have been capably and sympathetically performed, and the result is a valuable and unique contribution.

As in the remainder of the report, the basis of the section is the questionnaire which was distributed to the various institutions. It seems unfortunate, therefore, that no returns for the research schedule of these questionnaires appear to have been made from 6 of the 48 States, Idaho, Michigan, New Hampshire, New Mexico, Ohio, and Wisconsin. On certain topics in the schedule the number of returns was still further reduced, in some cases less than 30 of the States replying. As to how seriously this lack of completeness has affected the findings for the group, there may be some question. Not improbably the institutions reporting constitute a fairly representative cross section on most matters. Moreover, the survey staff which interpreted the data included no fewer than 10 station directors, headed by Director J. T. Jardine of Oregon, chairman for several years of the committee on experiment station organization and policy of the Association of Land-Grant Colleges and Universities, and the survey's advisory committee on agricultural research and experiment station work, which served as a board of review, was

composed of Directors L. E. Call of Kansas, M. J. Funchess of Alabama, H. W. Barre of South Carolina, and W. C. Coffey of Minnesota and President R. W. Thatcher of Massachusetts. The intimate knowledge of the entire station enterprise characteristic of these groups is perhaps a sufficient guarantee of the inclusiveness and general applicability of their findings and conclusions.

The successive chapters of the research section deal with control over research activities by agencies outside of the station organization, finance, results of research in agriculture, station organization and management, and standardization and special problems. The results embodied in these chapters are epitomized in a summary of 25 specific conclusions.

In the discussion of the relationships of the stations with other agencies, contacts with the Federal Department of Agriculture are taken up in some detail. The work of the Office of Experiment Stations in this connection is summarized as follows: "Federal supervision of State stations with respect to inspection and approval of accounts and in regard to formulating and approving research projects under the Hatch and Adams funds is unanimously approved by the 40 stations that report upon these relationships. Two stations of the 40 reporting believe that the use of Purnell funds might be made more effective if fewer restrictions were imposed. All stations agree that a scrutiny of research projects by the Federal Department of Agriculture results in improving and maintaining standards of research and promotes long-time investigations that otherwise might be discontinued prematurely."

The statement points out that "it is frequently recognized that the advantages of Federal supervision as now administered by the personnel of the Federal office might be destroyed if different personnel attempted, as would be easily possible, to dictate research plans and methods inappropriate to the needs and capacities of State stations." It is made clear, however, that "the policy of the Office of Experiment Stations from the first has been publicly announced 'as one of participation rather than of control.' The vote of approval from the institutions secured by the survey is ample evidence that participation has meant valuable contributions in guiding and helping to shape standards of research, in the maintenance of national as well as State and local viewpoints, in continuity of research where local need and local pressure might otherwise have resulted in too great emphasis on expedient investigation."

As regards the other branches of the Department, the State stations that report as to stations conducted cooperatively "with the Department of Agriculture favor the present methods of administration. However, slightly more than half believe that more coordi-

nation and cooperation might be maintained between Federal field stations conducted independently of the State stations. Only 10 of 39 institutions reporting indicate any dissatisfaction with the Department of Agriculture with reference to 321 separate investigations carried on cooperatively between the stations and the Department. Such discontent as exists is concerned with delay in publication and delay in use. On the whole, the State stations acknowledge cordially aid on the part of the United States Department of Agriculture, and three-fourths of the States reporting express the belief that the Department of Agriculture should assume more leadership in planning researches of national scope."

One specific question which was asked in the survey dealt with the advisability and practicability of the Department centering its activities upon research to develop or expand fundamental principles, leaving studies of local and regional problems to the State stations. The response to this question from 33 of the 36 institutions reporting was that emphasis should be directed toward cooperation rather than to attempts to divide the field of research activity on a basis of local and national interests. The argument for this view is set forth as follows:

"(1) The State station is called upon to meet many local and sectional problems requiring research quite as fundamental in character as any program the Department might undertake. To wait upon the Department would be impracticable and ineffective. (2) The Department can not fulfill its functions and confine itself to research on fundamental principles. Application as well as discovery is the objective of research. Application of principles to regional problems and conditions is important and requires the best joint effort. (3) Research does not lend itself to 'piecework' in the sense of manufacturing standard articles. Through a policy of cooperation and participation, man power, funds, and facilities can be pooled to secure most effective attack without unwise duplication."

A suggestion that relationships between the stations and the Department might be furthered by a memorandum of understanding as to cooperation and participation in research within the respective States met with favor in only 6 institutions, while 25 opposed it. This attitude seemed to be due to a belief that while formal agreements might tend to standardize procedure and by preventing diverse conclusions and publications make it more certain that the public receive consistent advice from State and Federal sources, they might also curtail initiative and delay the prompt action sometimes necessary to effective results. "Further," it is pointed out, "real cooperation is between individuals and should be worked out with a minimum of restrictive and formal regulation. Administrative agencies have served their proper function when they have brought

workers together in mutual understanding and provided facilities and freedom for their individual cooperative task. Cooperative research work actually undertaken should be the subject of written plans and understanding, but these agreements should not encroach unduly upon the individual's initiative and freedom to carry on in accordance with the exigencies of the investigation undertaken."

Although it is stated that the idea is not uncommon that there is not always full cooperation by the stations and their personnel on problems which concern several States, a total of 94 projects covering such cooperation was listed by 30 of the 34 States reporting on this point. Such joint attack on outstanding common problems is deemed important, yet it is made clear that "efforts to cooperate and coordinate can not replace actual research in laboratory and field. Judgment and care are necessary to prevent overemphasis of either individual effort or cooperative relations. The main suggestions from the survey for guidance in this regard may be summarized as follows: (1) The subject-matter problem rather than the whole field of agricultural research should rapidly become the basis of regional cooperative research; (2) subject-matter conferences for joint consideration of a single problem or of a very few problems common to two or more States are most effective in outlining investigations and methods of coordinating effort. *The station about to undertake an investigation on a problem common to two or more States should take the initiative and solicit joint consideration; and (3) the practicability of specialization in research by the several stations of a region is worthy of further thought.* Such specialization might easily be carried too far; each State must meet its responsibility for State problems. Nevertheless, allocation of major research to selected stations may possibly be developed to a point beyond present practice."

To the more or less vexatious problem of the relationships of station research to commercial agencies, additional data are contributed. It appears that of 41 institutions reporting on this question 15 had no such relationships in 1928, while 1 station listed as many as 16 projects, another 15, a third 14, and the 26 stations with such projects a total of 120 projects, involving 113 cooperating agencies. The assistance rendered by these agencies amounted to $160,880 in cash, $52,870 in research fellowships, $3,950 in scholarships, and $26,505 in equipment and materials. This is not regarded as a complete record, but it is stated that the facts presented "are sufficient to indicate the extent of the problem, the possibilities for good, and perhaps for embarrassment. The survey has found keen interest in the formulation of policies for the guidance of the institutions in establishing and maintaining relationships of this kind.

The problem is becoming more pressing as demands for such research become more numerous and more important. Business increasingly displays a willingness to finance worthwhile investigations for which public funds are not available." As a guide in such situations, the report includes the statements of policy formulated by the committee on experiment station organization and policy of the Association of Land-Grant Colleges and Universities in 1928 and 1929.

Two chapters are given over to the costs and returns in research. The total income for the stations for the fiscal year 1928, exclusive of unexpended balances, is given as $14,209,755.04, while that for research by the United States Department of Agriculture for the corresponding period is estimated at $11,300,000. These sums have been computed to amount to approximately 43.5 cents for each $1,000 of capital invested in agricultural production as compared with $13 expended for research for each $1,000 invested in industry. On another basis, this investment for research in agriculture and home economics is about $2.09 for each $1,000 of gross income for agriculture as compared with approximately $10 invested for research by industry for each $1,000 of gross sales. Much variation was noted in the tax burden occasioned for the support of the stations in the different States, the amount per $100 of taxes paid being as small as 3.5 cents in some States and as high as 50 cents in others.

Three main reasons justifying the public financing of agricultural research were enumerated by the stations. The one most frequently mentioned was the basic nature of agriculture as a phase of national and State welfare. The interest of the public in promoting unrestricted use of the findings of research which may reduce cost of production and distribution, improve quality, and insure supply of agricultural products is also mentioned as "an essential element of the constant problem of placing agriculture on a parity with other industries, and yet maintain food supply, in quantity and quality, at a price consistent with the purchasing power of consumers."

A third important reason is the difficulty of organizing agriculture for self-supporting research. "Agriculture is made up of many enterprises and activities engaged in by large numbers of individuals operating under a wide diversity of conditions. The problem of self-financing for agricultural research is made more difficult by the fact that findings from agricultural research are so difficult to control through patent or otherwise. A new crop, a new cultural method, new herd management can not be monopolized, and any agency other than the public would have difficulty in securing financial returns on the discovery sufficient to encourage further research. The public gets its return through decreased cost of living and from the increased purchasing power of agriculture."

Agricultural research as carried on at the stations is generally recognized as for the most part distinctly practical. No fewer than 26 of the institutions reporting, however, emphasized the possibility of increasing the value of their service to agriculture, the State, and the Nation if more research could be undertaken to work out solutions of problems in advance of emergency conditions which result in great economic losses. "The State stations and the Federal Department of Agriculture could to-day foretell serious economic losses by reason of conditions which are not yet under study, and for which no provision is made in research appropriations. This situation is worthy of more serious consideration by those engaged in agriculture and by the public. To provide for more investigations of this kind would require larger appropriations for research and greater assurance than at present that funds will be continuing. Perhaps the millions of dollars of loss from the corn borer, hog cholera, infectious abortion, and grain smut might have been reduced, and some of the millions of dollars spent to meet these destructive agents after they had gained a foothold might have been saved, if earlier research had anticipated the need. Comparatively small amounts for adequate research well in advance of the real emergency in many such cases should greatly reduce both economic losses and costs of control."

The difficult task of evaluating the economic returns from research in agriculture was attempted by the collection from each station of estimates supported by concrete examples of generally recognized accomplishments. Although 13 institutions did not report or made no comment, and 4 others considered the undertaking impracticable, 35 stations reported data as to 252 contributions from which an estimate was computed. Taken collectively these benefits aggregate for 1928 alone a contribution of $842,470,995 in economic value to the agricultural industry. Of this amount over $207,000,000 is ascribed to gains from the use of new crop varieties introduced or produced by the stations or new methods for growing them; nearly $100,000,000 from the application of new methods for controlling plant diseases; nearly $88,000,000 from soil improvement and better maintenance; and the remainder largely from the application of new methods for livestock management and marketing, animal breeding, and animal disease control.

Even more elusive of exact appraisement but exceedingly valuable have been the contributions of research made available indirectly through educational and extension agencies. Thus in the field of undergraduate teaching 20 institutions reported that 40 years ago only about 16 per cent of the subject matter of their courses in agriculture was based upon the results of research, while at the present time more than 65 per cent of their vastly enlarged subject matter

is regarded as so grounded. Not all of this research, to be sure, was the work of the experiment stations, but their influence is nevertheless both potent and pervasive.

The chapter on station organization and management contains an analysis of the administrative requirements which indicates that although more than half of the station directors are also encumbered with other duties, "responsibility for the development and efficient functioning of the experiment station and its research is a task that in magnitude, in complexity, and in importance requires the full time of an energetic, qualified executive. The executive should have full responsibility and authority commensurate to this task, subject only to coordination with other lines of institutional activity." This coordination and unification, however, "is properly the function of one man who is in a position and qualified to secure results. This can best be done by one free from immediate, primary responsibility for development and functioning of any one of the three major fields—resident teaching, research, or extension. To be well done, this task calls for leadership, and not merely the settling of temporary difficulties or differences of opinion. This in turn requires time, not merely hurried moments borrowed from other primary duties."

As regards the research staffs, the survey indicated that at 33 institutions reporting a total of only 42 resident department heads, or about 20 per cent, were not also engaged in teaching or extension or both. Below the rank of department head, the proportion of full-time research workers was greater, rising to 25 per cent for those with the rank of professor, 36.4 per cent for associate professors, 42.5 per cent for assistant professors, 45.2 per cent for instructors, and 63.5 per cent for assistants. "The responsible heads of agriculture are apparently now doing their best to guard research against undue encroachment by the demands for teaching, extension, and general service. There is, perhaps, an increasing tendency to furnish leaders in research with qualified assistants to offset time required of such leaders for other duties. This is wise procedure if research leaders must divide their talents and energies. It will focus research effort under selected leadership and will coordinate research and its findings with the problems of agriculture, with teaching, and with extension."

On the whole, the advantages from the employment of teachers for research are thought by 21 of the 28 institutions reporting to outweigh the admitted disadvantages. "If the only objective were the promotion of research these disadvantages might warrant abandonment of the practice of thus dividing the time of research men. However, other divisions of the institution must be considered.

From this standpoint the employment of part-time research workers assists the institutions to retain qualified subject-matter specialists for teaching; permits employment of a greater variety of subject-matter specialists than would otherwise be practicable; tends to develop graduate work; and aids in improving extension in specialized fields."

Another important matter on which the report takes definite ground is that of adequate compensation of the staff. "The fact that 75 per cent of the heads of research departments in the experiment station receive salaries of $4,500 or less; that approximately 55 per cent of the experiment-station staff ranking as professors receive $4,000 or less and can not expect a salary of more than $4,500 unless they are on the staff of one of 8 institutions of the 29 reporting; the fact that 60 per cent of the experiment-station staff ranking as associate professors do not receive more than $3,500, indicate need for decided salary increases for the research staffs of the land-grant institutions' experiment stations." It is also pointed out that in general experiment-station employees are on duty for 11 out of 12 months, with no adequate differential in their favor over other employees of the institution who are on duty only nine months, and it is urged that the land-grant institutions as a group "inaugurate a standard practice which will equalize the difference of institutional service and the salary compensation." This is because "the experiment station and its research constitute a public agency. The public and not the staff member is most vitally concerned in securing the super effort of research workers, instead of merely an honest day's work. Much could be accomplished by salary standards enough higher to free the research workers from financial and home worries which come with small margins of funds for emergencies. A 25 per cent increase in salary scales would do much to attract men with outstanding qualifications for research, who now dismiss the idea on the ground of too low salary scales."

Numerous other phases of station activity are discussed in a constructive and illuminating way. Some unevenness of treatment may here and there be detected, as well as a few rather unexpected omissions, among them the subject of station publications and other means for the dissemination of results, but these should not overshadow the many merits of what has been presented for both informational and reference purposes. Like the report as a whole, the section well deserves serious study and reflection. Perhaps its most unique feature as compared with other appraisements of the experiment stations is the fact that it was prepared essentially by the station representatives themselves. It is this element of personal participation by this group which gives to the discussions their outstanding interest and value.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations, Arkansas Station] (*Arkansas Sta. Bul. 257 (1930), pp. 29, 30, 34*).—This report contains the two items following:

The determination of potassium in plant tissue.—The following form of the magnesium nitrate fusion is attributed to R. P. Bartholomew: "Place approximately 6 gm. of hydrous magnesium nitrate ($Mg(NO_3)_2.6H_2O$) in a 50 cc. porcelain crucible. Then weigh out accurately 0.5 gm. of the sample to be analyzed and put it in the crucible on top of the magnesium nitrate. Ignite over a Bunsen burner. *Important:* Start with a very low flame, and as soon as the magnesium nitrate melts stir it thoroughly with a glass rod until all of the plant tissue is wetted. Wipe off the stirring rod with a small piece of filter paper which is put into the crucible. The crucible is inclined slightly and the flame made slightly larger and placed under the outer end. The flame is moved back gradually as the mass becomes dry. Gradually increase the heat until all NO_2 fumes are driven off. Place the cover on the crucible and heat with the full blast of the burner for 10 minutes to insure decomposition of all the nitrates. It requires from 25 to 30 minutes to make a fusion. Let cool and then scrape the fused mass from the sides of the crucible with a spatula. Crush the lumps with a pestle and transfer the material to a 300 cc. Erlenmeyer flask. Add 100 cc. of water and boil from 3 to 5 minutes. Filter into a graduate flask and wash to volume. Take an aliquot and precipitate with chloroplatinic acid and filter and weigh in the usual manner."

"For comparative studies where an error of 0.1 to 0.3 of 1 per cent will not affect the results, the method can be used very satisfactorily."

Cause of hydrogen-ion concentration drift in submerged soils, G. Janssen, R. P. Bartholomew, and L. C. Kapp.—"It was concluded that neither moisture, manganese, nor iron were serious factors in causing drift of the E. M. F. and of the inability of obtaining duplicate readings. The principal influence causing duplicate soil samples not to check was due to the excessive amount of CO_2 in submerged soils. Some soils contained as high as 700 p. p. m. of CO_2. When pH readings were made on these soils and if these soils were shaken while readings were taken, or even between the period of making duplicate readings, they would vary to as high as 2 pH. This was checked by introducing CO_2 into the solution equivalent to the amounts present under natural submerged conditions."

[Investigations of the division of chemistry, New York State Station] (*New York State Sta. Rpt. 1930, pp. 50, 51–53, 55*).—A considerable variety of work reported includes the following items:

Agricultural liming material.—The theoretically higher neutralizing value of limestone of relatively high magnesium content having been indicated as appearing in actual practice, it is believed, both for this reason and because magnesium deficiency appears to be of not infrequent occurrence and because total neutralizing power is much more readily determined than are the individual calcium and magnesium contents, that serious consideration should be given to the reporting of lime analyses "so as to give full credit to the neutralizing value of the magnesium."

Dairy chemistry.—The researches on casein, reported last year as indicating casein to be a mixture of three individual proteins (E. S. R., 62, p. 407), have now been brought to such a point as to "furnish the first recorded use of monomolecular proteins in serological work. Incidentally they show that a coctoprecipitin specific for a heated antigen, and which distinguishes it from unheated antigen, can be produced by the rabbit. . . . By anaphylactic reactions we were able to show definitely that the alcohol-soluble protein extracted from casein by Osborne and Wakeman some years ago is not the same as our acid-alcohol soluble protein having a molecular weight of 375,000. . . . Osborne and Wakeman found about 0.7 per cent of their alcohol-soluble protein in casein, while in our experiments we reported that in the neighborhood of one-third of the total crude casein was the acid-alcohol soluble protein of molecular weight 375,000. Further work has shown that the amount of the latter protein in crude casein varies considerably, but we have never found less than 15 per cent in any we have examined."

Investigations on grape juice manufacture.—The colloidal material in grape juice was found to comprise about 8 per cent of protein, 7 per cent of pectin, and the remainder of polysaccharides, of which the nature is not yet known. The removal of the colloidal material was shown to render tartrate crystallization much more rapid and otherwise to improve the product. "The removal of the colloids makes a sparkling clear juice. The color of this juice may be lighter or darker, depending on how the colloids are removed."

Changes in the phosphorus content of growing mung beans, J. E. Webster and C. Dalbom (*Jour. Agr. Research [U. S.], 41 (1930), No. 11, pp. 819–824*).—Leaves, branches, stems, seeds, and pods of plants at various stages of growth in unfertilized soil and in plats treated with superphosphate at 600 lbs. to the acre were analyzed by the authors of this contribution from the Oklahoma Experiment Station for ether extract and total, inorganic, and organic phosphorus. The ratio of inorganic to total phosphorus was also studied.

"A most interesting finding is the relatively small change that takes place in the amount of inorganic phosphorus present in any one organ. In fact the amount of inorganic phosphorus in any organ is relatively constant except when the plant is small, and apparently phosphorus as taken into the plant is metabolized to organic forms for storage. In the green plant lipoid phosphorus constitutes only a small fraction of the whole and varies little at different stages in the growth of the plant. Apparently it is not a storage form of phosphorus in green plants. . . .

"On the basis of quantities present there is no evidence that phosphorus is transferred from the leaves and branches to the stems, and it is assumed that the localization of phosphorus follows the normal ash intake and is not the result of metabolic activities."

Vitamin A of butter, R. A. Morton and I. M. Heilbron (*Biochem. Jour., 24 (1930), No. 4, pp. 870–873, figs. 3*).—In this preliminary survey of the question of the distribution in butter of carotin and of vitamin A, extracts of the nonsaponifiable matter of samples of New Zealand and Danish butter were subjected to spectrographic analyses and to the antimony trichloride color tests.

In the former test the New Zealand butter showed color maxima at 492, 462, and 432$\mu\mu$ in chloroform solution and at 480, 452, and 427$\mu\mu$ in alcohol. From a comparison with pure carotin it was estimated that the butter extracts contained about 1 part in 200 of the pigment. The absorption curve of the butterfat differed from that of carotin, however, in showing rapidly increasing absorption on the ultra-violet side of 380$\mu\mu$ and with its maximum near 272$\mu\mu$.

It was estimated that the nonsaponifiable matter of New Zealand butter contains in addition to about 0.5 per cent of carotin sufficient vitamin A to make its potency not more than about 6 times that of a good cod-liver oil.

The sample of Danish butter examined in the same way showed a much smaller carotin content, 0.1 to 0.15 per cent, a vitamin A content not very different from that of the New Zealand butter, and a much higher content of the material responsible for the band near 272$\mu\mu$. In the antimony trichloride color tests the blue color showed both the maxima for carotin, 591$\mu\mu$, and for the liver oil vitamin A, 624$\mu\mu$, the former indicating a carotin content of about 2 per cent and the latter about 5 times that associated with an equal weight of a good cod-liver oil. The nonsaponifiable material from the Danish butter gave a very sharp band at 620 to 622$\mu\mu$, the intensity indicating that the extract had a potency about 2.45 times that of cod-liver oil. No band at 592$\mu\mu$ could be recognized.

"It will thus be seen that the direct absorption spectra data and the study of the antimony trichloride blue colors give a consistent account of the properties of the nonsaponifiable matter from butter. The recognition of carotin, together with the distinct vitamin A of liver fats in a product derived from milk, is of importance and lends support to Moore's view [1930] that carotin can be converted in vivo to vitamin A."

Bibliography of organic sulfur compounds (1871–1929), P. Borgstrom, R. W. Bost, and D. F. Brown (*[New York]: Amer. Petroleum Inst., 1930, pp. [5]+187*).—*The references constituting this bibliography cover only sulfur* compounds which may occur in petroleum, their properties, uses, and methods of removal from petroleum products. A very brief statement of content accompanies each reference.

The identification of alkaloids by precipitation.—I, A natural classification of the alkaloids based on precipitation, C. C. Fulton (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 4, pp. 491–497*).—It is stated that "if alkaloids and reagents are arranged in columns, one ascending and one descending, they can be placed opposite each other in such a way as to show that an alkaloid is precipitated in solution 1 by all the reagents standing above it, and by none of those below it. . . . If an attempt is made to extend this scheme to all the alkaloids and reagents, certain inconsistencies develop. These inconsistencies, with the exception of a few due to oxidation, disappear if the alkaloids are arranged in groups. The classification so obtained is an entirely natural one."

In order that it may cover very generally the bases precipitable by the alkaloid reagents, the classification has been made to include three groups of substances nonalkaloidal though possessed of basic properties and precipitable by certain of the alkaloid reagents, as well as six classes of the alkaloids proper, thus: (1) The potassium and ammonia class, (2) the caffeine class, (3) the aniline and pyridine class, (4) the atropine class, (5) the cocaine and cotarnine class, (6) the quinine class, (7) the narcotine class, (8) the protein class, and (9) the basic dye class.

"The alkaloidal solutions required are practically never more concentrated than 1 to 1,000. Hence, a few milligrams of an alkaloid suffice for its classification and even for the tentative identification of an unknown. Fully developed and combined with microscopic tests, the system will insure the identification of any pure alkaloid that has been studied, and not more than 5 mg. will ever be required."

The chemical composition of authentic samples of whole wheat flours and modified whole wheat flours, L. H. Bailey and S. C. Rowe (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 4, pp. 503–506*).—The authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., examined 18 samples

consisting of a normal whole wheat flour, the same minus 10 per cent of its bran content, and the same with 10 per cent of bran added, the flour samples thus treated having been made from six types of wheat. Determinations were made of the moisture, protein, lipoids, sugars, starch, ash, calcium oxide, magnesium oxide, crude fiber, pentosans, and six of the ratios relating these values.

"From a review of the figures obtained it is apparent that the crude fiber results indicate more definitely the removal or the addition of bran than do any of the other determinations. The pentosan determination is next in this respect. The ratios of starch to crude fiber, starch to ash, and starch to pentosans are significant. For example, when 10 per cent of the bran was removed the maximum figure for crude fiber found was 1.62 per cent, whereas the minimum figure found for flour from the whole wheat berry was 2.23 per cent, a difference of 0.61 per cent. The pentosans show a difference of 0.66 per cent. With these same flours the minimum and maximum starch to crude fiber ratios varied from 37.8 to 26.4, a difference of 11.4; starch to ash 48.2 to 35.9, or 12.3; and starch to pentosans 10.7 to 8.8, or 1.9. Thus there is a definite dividing line between the two flours."

Some comparisons between commercially and experimentally milled flours, T. A. Pascoe, R. A. Gortner, and R. C. Sherwood (*Cereal Chem., 7 (1930), No. 3, pp. 195–221*).—The authors of this contribution from the Minnesota Experiment Station present a rather full historical outline and new comparative experimental data considered to justify the conclusion, among others, that flours milled in a commercial mill may have a saccharogenic activity as much as four times that of flours milled from the same wheat samples in a small experimental mill. The degree of granulation of flours is an important factor in the consideration of the saccharogenic properties, as is shown by the fact that grinding a sample of flour milled in the commercial mill in a ball mill for 20 hours increased the saccharogenic activity approximately 35 per cent.

"The basic procedure of the American Association of Cereal Chemists experimental baking test, without extended fermentation periods, does not permit detection of flours low in saccharogenic activity (when saccharogenic activity is measured on a flour-water suspension by the Rumsey method) from loaf volume values, as evidenced by the fact that the 'commercial' flours and the 'experimental' flours while differing materially in saccharogenic activity did not differ appreciably in loaf volume." In the peptization of the flour proteins by solutions of potassium halides the definite lyotropic series KF>KCl>KBr is demonstrable (in which connection it is stated that "the coefficients of variability were calculated for these halide salts, and the KBr series, although showing the highest peptization, showed the lowest variability)." "The series of experimental and commercial (patent and straight grade) flours gave a coefficient of correlation of $r=+0.797\pm0.041$ between protein content and loaf volume. A similar correlation on the mill-stream series of flours, all milled from one sample of wheat, was $r=-0.018\pm0.163$."

"The serious objection recently raised against the present definition of a 'globulin' is entirely justified. The coefficients of correlation between loaf volume and the fraction peptized from the mill-stream flours by the salts were -0.186 ± 0.158 for the KBr series, -0.235 ± 0.072 for the KCl series, -0.317 ± 0.147 for the KF series, and -0.241 ± 0.154 for the $MgSO_4$ series. The correlation coefficients between total protein content and the percentage of protein peptized from the mill-stream flours by the various salts varied from +0.839 to +0.877, and the correlation between a variable and the deviation of a dependent variable from its probable value were found to be +0.369

for KBr, +0.555 for KCl, +0.606 for KF, and +0.548 for $MgSO_4$ solutions (N/2)."

Fat: Its estimation in wheaten products, C. W. HERD and A. J. AMOS (*Cereal Chem.*, 7 (1930), No. 3, pp. 251–269, fig. 1).—An extension of work previously noted (E. S. R., 59, p. 711), the experiments here reported indicated a loss of weight at 93° C. from a fat extracted by ether from wheat products up to a period of two hours, whereafter the weight remained constant. The physical properties of the fats examined continued a progressive change after the loss in weight had ceased.

In a comparison of hydrolysis with direct extraction methods it was found that the first-named type of method invariably gave results higher than those of the direct extraction. Further, "the direct extraction and the acid hydrolysis methods give products more free from nitrogen and phosphorus than do the other methods. It is suggested that the acid hydrolysis method may hydrolyze, partially at any rate, the lipoid molecule." It was found also that "the acid hydrolysis method gives comparable results on flour and the bread made from it.

"It is finally suggested that the direct ether extraction will give a measure of the free fat existing in the product, but that the acid hydrolysis method gives the total fat content, that is, the free fat plus the combined fat, after liberation from its combination."

The use of lead acetate in the determination of the acidity of fruit products, B. G. HARTMANN and F. HILLIG (*Jour. Assoc. Off. Agr. Chem.*, 13 (1930), No. 2, pp. 259–265, figs. 3).—The principle of the method proposed in this contribution from the food control laboratory of the Food, Drug, and Insecticide Administration, U. S. D. A., is that of the precipitation by lead acetate of the lead salts of the fruit acids with the liberation of the chemically equivalent quantities of acetic acid. "The liberated acetic acid is a true measure of the acidity, and with the precipitation of the lead salts a substantial portion of the coloring matter of the fruit is removed. Accurate titrations on a deleaded portion of the filtrate are then made possible."

The preparation of the sample solution and of the reagents and the determination proper are directed to be carried out as follows:

"*Preparation of solution.*—If the material to be analyzed contains insoluble solids, prepare a sample solution as directed in Methods of Analysis, A. O. A. C., 1925, p. 209. (It is, of course, unnecessary to prepare a sample solution of fruit juices.) For the determination of the acidity of a fermented beverage, remove the alcohol, because the coloring matter of the fruit is soluble in alcohol. Bring to incipient boiling such products as carbonated soft drinks to remove carbon dioxide.

"*Reagents: Nitric acid solution.*—Dilute 15 cc. of concentrated nitric acid to 1 liter with boiled distilled water. *Lead acetate solution.*—Dissolve 100 gm. of normal lead acetate in 300 cc. of boiled distilled water containing 10 cc. of glacial acetic acid. Boil for 10 minutes, cool, make to 1 liter with boiled distilled water, and filter.

"*Determination.*—Transfer 200 cc. of the sample solution or 25 cc. of the fruit juice to a 250-cc. volumetric flask and adjust the volume, if necessary, to about 200 cc. with boiled distilled water. Add 20 cc. of the nitric acid solution and shake. Then add 20 cc. of the lead acetate solution, shake, make to mark, and filter. Add dry potassium oxalate to the filtrate to remove lead, being careful not to add a large excess, and refilter. Titrate 100 cc. of the filtrate with N/10 sodium hydroxide, using phenolphthalein as the indicator. Determine the acidity of the reagents used by running a blank in the same manner as in the procedure."

Added artificial color in the form of moderate quantities of the permitted coal-tar dyes, as well as the natural color of the fruit products examined, was removed with the lead salt precipitate to an extent sufficient to prevent interference with the phenolphthalein end point.

Standardized cheese, and cheese-analysis, F. H. McDowall (*New Zeal. Dept. Sci. and Indus. Research Bul. 21 (1930), pp. 19, fig. 1*).—The results of a study at the Dairy Research Institute, New Zealand, to determine the permissible errors and the reason for these errors in the results of different analyses of standardized cheese are discussed in this bulletin. The recognized methods of analyses are also presented.

The quantitative determination of egg in ice cream, N. C. Smith (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 2, pp. 272–291*).—Contributed from the California State Department of Agriculture, the present paper reports in some detail the development of a method dependent "upon the quantitative recovery of lipoid phosphorus from ice cream by means of the Roese-Gottlieb (Mojonnier) extraction of the lipoids followed by a colorimetric determination of the phosphorus. Data are presented relative to the lipoid phosphorus content of ice cream and various ice cream constituents; also of eggs and egg products. By the use of these data, particularly the average values for egg-free ice cream and for dry egg yolk, a formula was prepared by the use of which the percentage of dry egg yolk in ice cream is calculated from the lipoid phosphorus content. From this value the fresh egg yolk percentage may be readily approximated by multiplying the former by two. If desired, the results may be expressed in terms of whole egg solids by using in the formula a different constant which is derived from the average value for lipoid phosphorus in whole egg solids."

The determination of caffeine in decaffeinated coffee, W. F. Allen (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 2, pp. 265–272, fig. 1*).—The final weight of the caffeine residue as obtained by the Official methods for caffeine in coffee applied to the analysis of decaffeinated coffee was shown in work here reported from the Michigan State College to give a figure for the caffeine content decidedly higher than did the nitrogen determination on the residue. The weight of the pure caffeine obtained by quantitative sublimation from the residue was found to check very closely with the caffeine content indicated by the nitrogen determination. The nitrogen determination method, carried out with due precaution taking into consideration the very small quantity (about 0.5 mg.) of the nitrogen dealt with, is considered the most satisfactory procedure for caffeine in decaffeinated coffee.

A sublimation apparatus is described and illustrated.

Floral changes in the fermentation of sauerkraut, C. S. Pederson (*New York State Sta. Tech. Bul. 168 (1930), pp. 37, pl. 1, figs. 14*).—From a study of several hundred cultures and the bacteriological examination of three normal and five specially inoculated sauerkrauts, it was determined that *Leuconostoc mesenterioides*, *Lactobacillus pentoaceticus*, *L. cucumeris*, and *L. plantarum* are the organisms occurring most frequently in fermenting sauerkraut, although many other types were also found. A considerable number of these were strains of species closely related to the four above named.

"Pure culture inoculation with *L. cucumeris* was found to change the flora of kraut, while the quality of the kraut produced was adversely affected. Pure culture or mixed culture inoculation with other organisms did not materially affect the flora or quality of the product. *Leuconostoc mesenterioides* is largely responsible for the early acidity development. The lactobacilli complete the fermentation."

The effect of pure culture inoculation on the quality and chemical composition of sauerkraut, C. S. PEDERSON (*New York State Sta. Tech. Bul. 169 (1930), pp. 29, figs. 14*).—Of 72 sauerkrauts prepared in the course of the investigation here reported, 47 were inoculated with pure cultures of some one of the following organisms: *Streptococcus lactis, Leuconostoc mesenterioides, Lactobacillus buchneri, L. pentoaceticus, L. delbrücki, L. cucumeris, L. plantarum,* and two cultures from LeFevre called *L brassicae.*

"Normal sauerkraut was found to complete its fermentation at 70 to 75° F. in from two to three weeks. At that time it normally attains an acidity of 1.5 per cent or more, the alcohol present is less than 0.6 per cent, and the ratio of volatile to nonvolatile acid is about 0.24.

"Inoculation with pure cultures of *S. lactis* improved the quality of the kraut and did not affect the by-products produced. Inoculation with the so-called *L. brassicae, L. cucumeris,* or *L. plantarum* was detrimental to a good fermentation. The quality of the krauts was poor, and the predominant fermentation was of the pure lactic acid type resulting in little acetic acid, alcohol, or carbon dioxide. Such kraut was more susceptible to yeast spoilage. Krauts inoculated with pure cultures of *L. pentoaceticus* were fair in quality, but had an abnormal flavor. These krauts showed an abnormally high volatile acid content. Although a decided variation can be produced by pure culture inoculation, the use of certain strains especially has a decided detrimental effect. In order to have a beneficial effect it is apparent that the normal floral change in kraut must be duplicated."

This work extends that reported above.

METEOROLOGY

The unprecedented drought of the summer of 1930, C. F. MARVIN (*U. S. Dept. Agr., Weather Bur. [Rpt. Chief] 1930 [Mimeogr.], pp. 1–7*).—The drought of 1930 in the Eastern and Central States, characterized as the most severe in the climatological history of the United States, is discussed in some detail and compared State by State and month by month up to the end of August with the outstanding droughts of 1881, 1894, 1901, 1911, 1916, and 1924.

"The drought seriously affected all growing crops, and the scarcity of water for livestock, and in some sections for domestic use, became a serious problem." The effect of the drought was also reflected in unusually low water stages in rivers, in drying up of many smaller streams, and in the failure of wells and springs. It is stated that the "unusual conditions are best explained as a prolonged stagnation of the air over nearly the whole continental extent of the United States."

Cycles and seasonal weather forecasts, C. F. MARVIN (*U. S. Dept. Agr., Weather Bur. [Rpt. Chief] 1930 [Mimeogr.], pp. 7–9; also in Bul. Amer. Met. Soc., 11 (1930), No. 12, pp. 210 211*).—Referring to cycles and seasonal weather forecasts with reference to droughts and similar happenings, it is indicated that present knowledge is insufficient to furnish a reliable basis for such forecasts. In view of the complexity of the problem and the many factors involved, it is held that forecasts "from a single factor, such as periodicity in sun spots or variations in solar rediation, can have no hope of success. . . . Forecasts on any such basis as this will fail quite as many times as they might succeed, and even at the best the intervals between recurrences are subject to such wide changes in length of interval, and the magnitude of the extremes, although sometimes large, are frequently entirely insignificant, so that the reality of cycles is very problematical, and forecasting by means of them is as yet unsuccessful." It is stated that "the subject of correlations and periodicities

of weather phenomena are under continuous investigation by one or more of the experts of the bureau, in the hope of discovering useful information."

Instructions for making aerological observations (*U. S. Dept. Agr., Weather Bur. Circ. P (1930), pp. IV+94, figs. 59*).—These instructions for making aerological observations by all methods used by the Weather Bureau (kites, airplanes, and balloons other than pilot balloons) supersede those previously noted (E. S. R., 60, p. 617).

Aerological code (pilot balloons), 1930 (*U. S. Dept. Agr., Weather Bur., 1930, [rev. ed.], pp. II+18, figs. 2*).—This code for "enciphering pilot-balloon observations at all Weather Bureau stations authorized to transmit same by telegraph, radio, or other means" is intended to supersede all previous instructions on the subject.

SOILS—FERTILIZERS

[Soil-fertilizer items at the Arkansas Station] (*Arkansas Sta. Bul. 257 (1930), pp. 22, 23, 24, 27, 30, 31, 33, 34*).—These include the following:

The effect of legumes.—Growing cowpeas and soybeans the same season after oats and plowing under, as indicated by the total value of all crops removed during the 2-year rotation, was found by M. Nelson to be a sound practice for soil improvement with legumes. "However, the largest increases in the yield of corn grown as a trial crop after legumes usually comes from plowing under the crops of cowpeas and soybeans that have occupied the land during a previous season. On soil comparatively low in supply of organic matter, the corn crop following legumes, disposed of in various ways, appears to withstand drought longer than check plats that have not grown legumes. Legumes and check crops make better growth on the better soils, but the increases shown by trial crops are better on less fertile soil low in humus and nitrogen supply."

The work of G. Janssen would appear to indicate that "the soybean nitrogen-assimilating bacteria may live in submerged rice soils for at least one season without injury."

Effect of cultivation on nitrate production and the retention of moisture in soils.—Report is made of the work of R. P. Bartholomew, indicating that both for nitrate production and for moisture conservation the most important function of cultivation is that of the suppression of weed growth. Cover crops appeared to have prevented an annual loss of 30 lbs. of nitrogen.

Rôle of potassium.—Bartholomew and Janssen report that "corn, cowpeas, Sudan grass, and soybeans took up potassium very rapidly at all stages of growth. The absorption varied from 0.4 mg. to 20 mg. per plant in 10 hours, depending upon the initial concentration of the potassium in the solution. Absorption took place almost as rapidly at night as it did in the day time. If the supply of potassium given a plant is greatly diminished (from 10 p. p. m. to 0.5 p. p. m.), the plant rapidly readjusts itself and continues feeding."

In a study of crop depletion of exchangeable soil potassium, Bartholomew and Janssen found corn crops to remove exchangeable potassium that could not be replaced by the use of as much as 450 lbs. of potassium chloride per acre annually.

Janssen and Bartholomew found "the analyses for carbohydrates of cowpea plants grown on a low-potassium nutrient solution are higher in reducing sugars and total sugars but lower in starch than plants grown in high-potassium nutrient solutions. The total nitrogen uptake was greater for the low-potassium plants than the high-potassium plants. The soluble nitrogen, with exception of two analyses of the high-nitrogen high-potassium plants, was greater in low-potassium plants than in high-potassium plants. The amino nitrogen was higher

in all instances in low-potassium plants as compared with high-potassium plants."

Effect of irrigation on reaction and availability of phosphorus in rice soils.—Bartholomew found that "under the conditions studied, phosphatic fertilizers should not be recommended for rice. The large amount of soluble basic material added annually in the irrigation water has caused the soils to become nearly neutral or alkaline. Thus the soluble phosphorus, after addition, is reverted to forms unavailable for rice. In addition, some of the water-soluble inorganic phosphorus is changed to organic phosphorus after irrigation takes place. The organic phosphorus has also been shown to be unavailable to plants."

Availability of the soil elements in rice soils.—L. C. Kapp reports experiments in which "varying amounts of monocalcium phosphate from 0 to 1,000 lbs. per acre were applied in duplicate with 500 lbs. of a 4–0–4 fertilizer. Ammonium sulfate and sodium nitrate were used separately as the nitrogen carrier. . . . The plants . . . were separated into grain and straw and analyzed for magnesium and calcium. No differences could be detected. At present potassium determination of the plants, and soil extracts from submerged soil treated with calcium ions, are being made to determine if the calcium displaced enough potassium to cause this increase in yield."

Persistence of soil differences with respect to productivity, R. J. Garber and M. M. Hoover (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 883–890, fig. 1*).—"The data presented here indicate that differences in natural productivity of soil may persist over a period of years even though the soil be subjected to various treatments. Moreover, the relation which was found [in tests here reported from the West Virginia Experiment Station] between the yields of the uniformity crop of oats and the average yields of the subsequent crops in the rotation experiment discussed in this paper would seem to justify one in locating replicated plats on the basis of such a uniformity test and in such a manner as to equalize the difference in initial productivity as revealed by the uniformity test."

Soil sampling with a compressed air unit, H. F. Blaney and C. A. Taylor (*Soil Sci., 31 (1931), No. 1, pp. 1–3, figs. 2*).—The apparatus indicated is here described in a brief contribution, illustrated by two photographs, from the Bureau of Public Roads, U. S. D. A. It consists essentially of a compressor mounted in a truck and capable of a displacement of 59 cu. ft. a minute at 800 r. p. m., together with a compressed air hammer "of the clay digger type, capable, when working under an air pressure of 100 lbs. to the square inch, of delivering 2,250 blows a minute, each blow striking with a force of 16 ft.-lbs. Extending down into the soil tube is a 6-in. guide rod. . . . The trigger grip gives the operator ready control of the hammer, and by properly cramping the guide rod in the end of the soil tube, allows very little vibration to be transmitted to the arms of the operator."

The new equipment is used in conjunction with an improved soil tube (E. S. R., 61, p. 503) and a pulling jack (E. S. R., 61, p. 504) already noted.

Soil survey of Navarro County, Texas, M. W. Beck and E. H. Templin (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1926, No. 20, pp. 20, pl. 1, fig. 1, map 1*).—Navarro County, in east-central Texas, has an area of 697,600 acres, ranges from flat to steep and eroded in surface, and has a fairly well developed regional drainage. The survey here reported, in cooperation with the Texas Experiment Station, mapped 22 types representative of 16 series, the largest areas listed being those of Wilson clay loam 17 per cent, Wilson fine sandy loam 16.9, Houston clay 12, and Catalpa clay 11.2 per cent.

The development of the soil profile in North Wales as illustrated by the character of the clay fraction, G. W. Robinson (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 618–639*).—In a report and discussion from the University College of North Wales are taken up changes in the composition of the clay fraction in various horizons of some typical North Wales profiles, changes in the molecular ratio of silica to sesquioxides throughout a soil profile, these changes affording an indication of the nature of the eluviation which has affected the mineral portion of the soil, and some other experimental observations. A general tendency toward the enrichment in sesquioxides of the lower layers of the North Wales soils was noted, this change being at the expense of the sesquioxide content of the surface layers. It is considered that this silica-sesquioxide ratio of the clay fraction is indicated by this work as an important aid to series definition. The soil profile as developed under the conditions of North Wales appeared to be of the brown earth type with podsol development in the uplands under heath vegetation.

"The importance of the parent material is emphasized. North Welsh soils are generally of a loam character. The absence of light sandy soils in situations permitting profile development precludes the occurrence of typical podsols in the lowlands. The high content of organic matter resulting from artificial grassland conditions results in affinities with prairie soils."

"Single value" soil properties: A study of the significance of certain soil constants.—II, Studies on Natal soils, J. R. H. Coutts (*Jour. Agr. Sci. [England], 19 (1929), No. 2, pp. 325–341*).—The work here noted is an extension of that of Keen and Coutts, noted from the first paper (E. S. R., 63, p. 510) of this series, and is contributed from the Natal University College.

"Confirmation is obtained of the principal conclusions reached in the first paper of this series with regard to the physical significance of the sticky point, the loss on ignition, the clay content, and the water content in equilibrium with an atmosphere of 50 per cent relative humidity. It is shown that the first and second and the third and fourth pairs of quantities, respectively, are closely correlated with one another, and that the first and second give the better estimate of the colloid status of the soil. The water content in equilibrium with an atmosphere of 50 per cent relative humidity generally differs but little from the air dry moisture of the soil. . . .

"The significance of the soil constants determined by the Keen and Raczkowski [E. S., R., 50, p. 809] perforated box experiment is reexamined. It is found that the same conclusions drawn with regard to the sticky point apply to the water retained by the saturated soil in the perforated box; that the pore space is closely correlated with the clay content of the soil; and that the volume swelling is closely correlated with the water retained, and, therefore, with the sticky point—so that the two factors, water retained and volume swelling, give a good estimate of the colloid status of the soil. It is therefore suggested that the Keen-Raczkowski perforated box experiment might usefully be introduced as a preliminary measurement in testing the general nature of soils of unknown type. In cases where it is necessary only to determine whether there are significant differences between a large number of samples, however, the information can be obtained most easily from measurements of the sticky point (or loss on ignition) and the air dry moisture."

The laws of soil colloidal behavior.—III, IV, Isoelectric precipitates, S. Mattson (*Soil Sci., 30 (1930), No. 6, pp. 459–495, figs. 2; 31 (1931), No. 1, pp. 57–77, figs. 3*).—Numerous experimental data are used in support and illustration of the viewpoints presented in a somewhat extended discussion of topics, in continuation of earlier work (E. S. R., 63, p. 211), including isoelectric

"hydroxides" of iron and aluminum, isoelectric iron and aluminum "phosphates," the composition of positive and negative ferric phosphate, isoelectric "silicates," the sulfated silicate complex, influence of state of dispersion of reacting materials on composition of precipitates, influence of divalent cations on the aluminum and ferric silicate systems, influence of the $\frac{SiO_2}{R_2O_3}$ ratio on the adsorptive and electrokinetic behavior of the natural soil colloids, factors governing the composition of the inorganic soil colloids, the law of definite proportions, and charge and crystallization.

"The entrance of the phosphate and silicate ions into the sesquioxide complex lowers the isoelectric pH because these ions displace the diffusible acid anions as well as the hydroxyl ions. There are many isoelectric phosphates and silicates. The more highly phosphated or silicated the complex the lower is the isoelectric pH. The lower the phosphate or silicate concentrations in the solution the greater is the relative proportion entering into combination. In high concentrations of the phosphate and silicate ions the isoelectric complex approaches but never attains full saturation, i. e., $P_2O_5/Al_2O_3=1$ and $Sio_2/Al_2O_3=3$, provided that other cations which form insoluble phosphates and silicates are absent, and that colloidal silica is not precipitated with the complex.

"All the ions in the system mutually displace one another according to the energy of each. At the isoelectric point there is always a certain small number of diffusible anions in combination. At that point the anionic and cationic dissociation must be equal. There is a balance between cations and anions in the complex, but a stoichiometrical relationship between any two ions must be accidental and should not be looked for even when the colloid is 'purified.' This applies to the more or less crystalline natural colloids as well, for although the law of definite proportions must hold as far as the interior of the crystal is concerned, there is no such definiteness on the surface, which is very great in the colloids. The adsorption layer is very complex in its make-up and changes constantly with the conditions, such as the nature and concentrations of the ions in the solution, the pH, and the temperature.

"The work herein described will serve to explain the occurrence of the highly silicated and base-saturated soil colloids in the arid regions, the moderately silicated and more or less base-unsaturated soil colloids in the temperate and colder humid regions, and the almost completely desilicated and base-unsaturated soil colloids in the humid tropical regions."

Topics taken up in the second paper (No. IV) include the preparation of sodium humate, the isoelectric humates of aluminum and iron, isoelectric phospho-humate and silico-humates, isoelectric aluminum and ferric phosphosilicates, review of the isoelectric precipitates, and the sesquioxide soil colloid systems.

"The 'humates' differ from the 'silicates' and 'phosphates' in that the colloidal humic complex is quantitatively precipitated by the aluminum chloride and ferric chloride, in showing an electropositive maximum on the acid side of the isoelectric point, and, where the proportion of humus is high, in having a second isoelectric point. The ferric humates are isoelectric at a much lower pH than the aluminum humates of corresponding composition. The humate ion, or ion complex, displaces the orthophosphate ion and, to a still greater extent, the silicate ion. The orthophosphate ion strongly displaces the silicate ion. There is no apparent displacement of the orthophosphate ion by the silicate ion, for in the presence of the latter the proportion of the phosphoric anhydride in the complex increases somewhat. This anomaly

may be due to the formation of an addition complex and will be discussed later in connection with ion adsorption and exchange. The mineral soil colloid complexes react with aluminum and iron, forming isoelectric precipitates in exactly the same manner as the humus complex."

The nature of the base-exchange material of bentonite, soils, and zeolites, as revealed by chemical investigation and X-ray analysis, W. P. Kelley, W. H. Dore, and S. M. Brown (*Soil Sci., 31 (1931), No. 1, pp. 25–55, pls. 5*).—*The effect of grinding upon the exchangeable base content of bentonites and related minerals and soil colloids and the interplanar spacings of bentonites and soil colloids were among the subjects investigated in the experiments reported in the present contribution from the University of California.*

The data "seem to justify the definite conclusion that the substances composing the colloidal material of the soils that have been investigated are not amorphous, as has been commonly assumed, but on the contrary that they are composed chiefly of crystalline substances. . . .

"We have found that the replaceable bases occur not only on the surface of colloidal particles but also on the interior of the crystals. Since the X-ray analyses indicate an orderly arrangement of the atoms within the particles, and since the exchange of bases is stoichiometric, it is safe to conclude that the base-exchange substances are true chemical compounds. The replaceable bases, therefore, are not merely adsorbed on the surface of the particles, rather the bases are an integral part of the chemical constitution of the crystals. . . .

"The chemical and X-ray data clearly establish the fact that the inorganic soil colloids are not zeolites. . . . The bases that occur on or near the surface of the crystals may be replaced by calcium or sodium in the natural state, but the results of grinding experiments demonstrate that calcium and sodium do not extend into the centers of the crystals."

The relation of the results here recorded to those reported by other investigators is considered in some detail.

Electrofiltration: A new method of removing exchangeable bases from soil colloids, A. N. Puri (*Soil Sci., 30 (1930), No. 6, pp. 413–419, figs. 2*).—The apparatus here described and figured may be regarded as a further development in the direction indicated by Bradfield's simplification (E. S. R., 58, p. 717) of the electrodialysis cell applied to soil investigations by Mattson and further studied by Humfeld and Alben (E. S. R., 58, p. 717). Neither the semipermeable membrane of Mattson's apparatus nor the dense alundum thimble of Bradfield's 2-compartment cell were found necessary for work with soils. A suitable filter paper on a perforated copper support constituting the cathode was found satisfactory, water being poured upon the soil as required to keep the level above that of the platinum gauze anode.

The first of the two forms in which this "electrofiltration" principle was developed "consists of a glass cylinder (about 2.5 in. in diameter), a perforated copper disk provided with a screw for electrical connections, and a glass funnel provided with a flange, fitting exactly against the flange of the cylinder. Attached to the perforated disk are two copper rings with diameter slightly greater than the flanges of the funnel and the cylinder, and in which the latter fit snugly. A filter paper (preferably Watman 50) is placed on the copper disk and the flange of the cylinder is dipped into molten wax; after the excess wax is shaken off the cylinder is attached to the disk with the filter paper interposed between. The flange of the funnel is also dipped into molten wax and attached to the other side of the disk. The flanges of the cylinder and funnel are then clamped together by brass rings provided with thumb screws. . . .

"The cathode is the copper disk, and the anode a platinum wire gauze. Attached to the wooden lid holding the anode is a U-tube for circulating cold water when the apparatus is running. The electrodes are connected to the electric main, and the current density is kept below 0.5 ampere by a lamp resistance. The current flowing through the apparatus is further regulated by moving the anode up or down as required. The apparatus can be left running overnight because when the level of water goes down below the anode the current is automatically shut off. Ten to 20 gm. of the soil can be used at a time, and the filtration is fairly rapid, for the tendency of the soil colloids is to move upward toward the anode, therefore there is no risk of the filter paper being clogged."

The second form of the device is even simpler, consisting essentially of a perforated copper filter cone, or a copper or nickel gauze filter cone to fit the ordinary 60° funnel, the paper being fitted in the usual way while the platinum anode is supported in a cover set upon the funnel and dips into the soil suspension as in the first form described.

It is noted that, in addition to its application in extracting exchangeable bases, "electrofiltration can be used as a preliminary treatment of the soil for mechanical analysis, and gives closely agreeing values for clay with the (NaClNaOH) method and the 0.05 N HCl method, which have already been shown to effect complete dispersion of soil colloids."

Relation of ash constituents of pasture plants to the oxidation-reduction potentials of nutrients, H. P. COOPER and J. K. WILSON (*Soil Sci., 30 (1930), No. 6, pp. 421-430*).—This is a contribution from the New York Cornell Experiment Station in which are reported data on certain ash constituents of the grasses representing the plant successions most commonly accompanying the depletion of soils in New York pastures. The nitrogen and the silica-free ash contents of the grasses appeared to decrease with the depletion of the soils. Elements with relatively high standard electrode potentials, such as potassium and calcium, were found often the predominant mineral constituents in the ash of plants. A marked negative correlation between the potassium and the calcium content of the ash of pasture grasses was observed.

"It is suggested that there is a correlation between the qualitative order of removal of atomic metallic cations from soil colloidal complexes by electrodialysis and the order of the energy of removal, in equivalent volts, of the inmost normal valence electron of elements. Many organisms differentially absorb atomic nutrient cations in the same qualitative order as they are removed from soil colloidal complexes by electrodialysis. Plants which require fertile soils or strong nutrient ions for optimum growth are often intolerant of shade and require large quanta of radiant energy for optimum growth. Plants which normally require a rich nutrient medium and large quanta of radiant energy may synthesize organic compounds which, on oxidation, would be capable of supplying large quanta of radiant energy and may be of high food value, whereas plants which grow normally on poor soils and endure weak nutrient ions are often shade tolerant and of relatively low food value.

"The absorption of radiant energy of quality equivalent to or greater than the free energy decrease in the formation of simple electrolytes from the elements may greatly facilitate their assimilation by organisms. There is a wide difference in the quality of radiant energy necessary for the reduction of the common nutrient anions. Phosphorus is one of the most difficult to reduce, ultra-violet light being required for its reduction. Phosphorus in compounds with relatively high ionization constants is often relatively easily assimilated, since phosphorus in ionic form is probably more easily reduced than is phosphorus in molecular form."

Lysimeter investigations.—I, Nitrogen and water relations of crops in legume and non-legume rotations, R. C. Collison and J. E. Mensching (*New York State Sta. Tech. Bul. 166 (1930), pp. 90, figs. 3*).—A condensed report is made on detailed experiments involving 20 tanks, 12 of a highly productive Ontario loam, rich in lime, and 8 of a loam thought to be of the Lordstown series, less productive and much lower in lime content. "The purpose of this publication is to report on studies made under more or less controlled conditions of the water, soil, and nutrient relations of crops in legume and nonlegume rotations, while other mineral relations are left for subsequent reports. . . . The present report covers the first three rotations, or a period of 12 years." Six of the tanks "2, 4, and 8 ft. in depth, filled with Ontario loam soil, are compared as to their water, soil, crop, and nitrogen interrelations, and some interesting results are discussed."

A few among the many significant points brought out in the record here presented are as follows: The amount of water appearing as free drainage from the tanks varies with the amount of the precipitation, the cropping system, and the kind of crop occupying the soil. Temperature, as affecting evaporation, is also a factor. Practically all drainage occurs between November 1 and May 1, the largest proportion coming through the tanks during and just after the general thaw in early spring. The amount of drainage from any tank is largely a reflection of the total amount of dry matter removed in crops. Thus, an alfalfa-grain rotation on hill (Lordstown) soil which produced 32.4 lbs. of dry matter per tank during 12 years lost 296.4 liters of water by drainage, while similar tanks in a timothy-grain rotation which produced only 18.5 lbs. of dry matter per tank during 12 years lost 426.3 liters of water by drainage.

An exception to the above statement occurred in the alfalfa-grain rotation on hill soil which received nitrogen as dried blood. Fertilization with nitrogen in this case has decreased water utilization by the crop. This was found true for all crops in this rotation.

For uncropped hill soil, 40.4 per cent of the total annual precipitation has appeared in the drainage. For similar soil cropped to alfalfa, timothy, and grain, this proportion is 25.7 per cent, and for the Ontario soil cropped to alfalfa, timothy, and grain 19.2 per cent.

The minimum transpiration ratios for alfalfa on hill soil are 254 for the alfalfa-grain rotation, 210 for alfalfa-fallow, and 210 for alfalfa-grain with additional nitrogen. The fallow has apparently reduced water utilization by alfalfa to the same extent as has dried blood application, and probably for the same reason. The ratio for timothy is 218, for barley following alfalfa 149, barley following timothy 208, barley following alfalfa fertilized with nitrogen 111.

"Both alfalfa and timothy exhaust the soil of nitrates during growth, but there is a large difference in the amount of nitrates available in the two rotations during the time the tanks are in grains. Thus, on hill soil, the timothy rotation showed an excess of nitrogen over that used for crop growth of only 85 to 92 lbs. per acre for the 12 years. This excess for the alfalfa rotation was 250 to 260 lbs., or three times as much. When dried blood was applied the alfalfa rotation showed an excess of 300 lbs. of nitrogen per acre for the 12 years. For the alfalfa-fallow rotation this excess rises to 960 to 980 lbs. of nitrogen per acre.

"These large drainage losses of nitrogen from alfalfa rotations may be due either to fixation of nitrogen by alfalfa or simply to transformation of soil nitrogen brought about through the growth and decay of the legume. . . .

"The greatest nitrogen loss from the soils is through crop removal. On hill soil under an alfalfa-grain rotation over six times as much nitrogen was

lost in crops as in drainage. On the same soil under a timothy-grain rotation over four times as much nitrogen was lost in crops as in drainage. In an alfalfa-fallow rotation more nitrogen has been lost than when barley and wheat are grown during the years of fallow. Here, almost half the nitrogen lost was in the drainage. In the alfalfa-grain rotation fertilized with dried blood, almost six times as much nitrogen was lost in crop as in drainage. Less than one-fourth of the additional nitrogen applied is accounted for in crop and drainage.

"For Ontario soil, the alfalfa-grain rotation has lost two and a half times as much nitrogen as has the timothy-grain rotation. In the former rotation over eight times and in the latter rotation four times as much nitrogen was lost by crop removal as in drainage water.

"It appears that alfalfa has to a considerable extent depended for its nitrogen on the dried blood applied and has therefore fixed less nitrogen. . . .

"Differences in purity of stand of crops do not account for some of the comparatively wide differences in their content of nitrogen. Alfalfa has been fairly constant in composition. A larger amount of available soil nitrogen has caused a marked increase in the nitrogen content of the grain crops. . . . Under some conditions cereal straw may have a nitrogen content double that under normal conditions.

"Differences in response of the two soils have been less than were expected on the basis of their differences in the field. Ontario soil in a timothy-grain rotation produced 55 per cent greater crops than hill soil. On the other hand, in alfalfa-grain rotations this difference in total crops is not very marked. . . .

"Tanks of different soil depths have presented some interesting differences in the water and nitrogen relations of their crops. Four-foot tanks produced more dry matter than 2- or 8-foot tanks. Eight-foot tanks, although producing 8 per cent more dry matter than 2-foot tanks, nevertheless lost by drainage 25 per cent more water and 47 per cent more nitrogen than the latter."

Nitrogen and organic matter in Hawaiian pineapple soils, A. L. Dean (*Soil Sci., 30 (1930), No. 6, pp. 439–442., fig. 1*).—"It seems fairly evident [from this communication from the Hawaiian Pineapple Canners' Experiment Station] that our Hawaiian soils are rich in nitrogen as compared with the Southern States, and that their organic matter contains a higher percentage of nitrogen than the usual run of soils of the Temperate Zone. This latter observation is consistent with the tendency for the carbon-nitrogen ratio to become narrower with increasing mean annual temperature, as brought out by Jenny [E. S. R., 60, p. 118]."

Nitrate fluctuations in a South Australian soil, J. A. Prescott and G. R. Piper (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 517–531, figs. 5*).—The discussion presented in this contribution from the University of Adelaide, South Australia, is based upon a temperature and rainfall record and field observations covering the condition of fallow soils at the break of the season, the nitrate content of the rotation plats during the dormant season, soil conditions through the season, and the effects of the moisture content of the soil and of the temperature on fluctuations of the soil nitrate content.

"The rate of nitrification in the soil under the conditions prevailing at the Waite Institute is governed primarily by the soil moisture conditions. The activity is greatest in the surface layers which are cultivated during the process of fallowing. Temperature conditions are generally favorable throughout the year, although there is evidence that the high rate of nitrate accumulation in late spring, in spite of a rapidly falling moisture content, is associated with the higher temperatures prevailing at this period. The reaction to soil moisture

conditions is much more sensitive—during the characteristic summer drought there is little evidence of change in the nitrate content of the soil, the quantities of nitrate accumulated during the preceding period of activity remaining unchanged. Moreover, laboratory experiments indicate that the possibility of any marked change occurring at this period will only exist in very exceptional seasons when the summer rainfall is considerably in excess of the average."

Other details are considered at some length.

Influence of inorganic nitrogen compounds on reaction and replaceable bases of Norfolk sand, R. M. Barnette and J. B. Hester (*Soil Sci., 30 (1930), No. 6, pp. 431–437*).—It is stated in a report from the Florida Experiment Station that "ammonium sulfate increased the acidity and sodium nitrate the alkalinity of the deep phase of the Norfolk sand sodded to lawn grasses; [that] ammonium sulfate increased the acidity of the deep phase of the Norfolk sand more than did ammonium phosphate which had been applied in amounts equivalent in nitrogen content; . . . [and that] the decrease in H-ion concentration of the Norfolk sand (deep phase) induced by applications of ammonium sulfate was proportional to the amounts of ammonium sulfate applied, and correlated with a decrease in the total miligram equivalent cations in the replaceable state in the soil."

A dressing of 3 in. of clay decreased the acidification by the ammonium salts of a deep phase of Norfolk sand. Various effects on replaceable bases are also noted.

Ammonium calcium balance: A concentrated fertilizer problem, L. G. Willis and J. R. Piland (*Soil Sci., 31 (1931), No. 1, pp. 5–23, pls. 3*).—Pot experiments with a mixture of pure diammonium phosphate, potassium nitrate, and potassium chloride applied to a sandy soil of low absorptive capacity at a rate "equivalent to 96 lbs. to the acre, in the drill, of a fertilizer analyzing 17.5 per cent nitrogen, 35 per cent phosphoric acid, and 17.5 per cent potash," here reported by the North Carolina Experiment Station, have shown a toxic effect upon cotton seedlings considered to have been due largely to free ammonia from a diammonium phosphate. Injury by ammonium sulfate, chloride, or nitrate was not observed, and the alkalinity of the diammonium phosphate was considered not to contribute to the injury noted.

"Calcium salts were antagonistic to ammonia toxicity, calcium sulfate and chloride being more effective in this regard than calcium carbonate and phosphate. Magnesium salts exhibited the same effect, but they functioned less efficiently than did the corresponding calcium salts. The conversion of free ammonia to carbonate in the soil and its partial neutralization by reaction with the calcium salts could account for the greater part of the beneficial effect of the calcium salts, but there was some evidence that physiological antagonism was also a factor. . . . Monoammonium phosphate alone produced a lesser degree of injury than did diammonium phosphate. This relation was reversed when both were supplemented by admixture with calcium sulfate."

The decomposition of urea in soils, T. Gibson (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 549–558*).—Experiments on the decomposition of urea in 59 soil samples of extremely varied character are here reported in a contribution from the Edinburgh and East of Scotland College of Agriculture.

"Urea was decomposed readily in all and very rapidly in most of the samples. In mountain and heath soils the decomposition was generally active, especially in soil tests. Strongly acid peat samples (pH 3.1 to 3.3) decomposed from 0.44 to 0.86 per cent of their own dry weights of urea in 24 hours at 22 to 23° C. In solution and soil tests samples from permanent pastures pro-

duced a more rapid decomposition than those from cultivated land. In soil tests with pasture samples quantities of urea as large as 1 per cent of the dry weight of soil were converted to ammonia in 24 hours at 22 to 23°. Fertile arable soils produced a relatively slow decomposition in soil tests. Samples of forest soils were generally more active than those from cultivated ground. Strongly alkaline soils showed comparatively little activity in soil tests. Although urea is not absorbed by soils its rapid conversion to ammonia will generally prevent losses by leaching."

The availability of phosphatic fertilizers as shown by an examination of the soil solution and of plant growth, A. W. Greenhill (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 559–572, figs. 2*).—The growth of barley and the phosphate concentration of the soil solution, both of the cropped and of the uncropped soil, were examined simultaneously in pot cultures, after treatment of an acid soil deficient in phosphate with lime with and without slag or superphosphate.

Liming at the rate of half the lime requirement was found to have increased the concentration from about 0.7 part per million P_2O_5 to about 1 part per million and at the rate of twice the lime requirement to over 2 parts per million P_2O_5. "Phosphates depressed the concentration on the lightly limed soils, and on the heavily limed had variable effects. The superphosphate-treated soils showed rather lower concentrations than the slag-treated. Cropping raised the concentration on the lightly limed treatments, but on the heavily limed reduced it on the control and had a variable effect on the phosphate treatments. The concentration in the untreated soil was practically constant; after treatment the concentration fluctuated considerably, but tended to become more constant later. No relationship could be traced between the concentration and the soil-moisture content."

The repressive effect of lime and magnesia upon soil and subsoil potash, W. H. MacIntire, W. M. Shaw, and J. B. Young (*Jour. Agr. Sci. [England], 20 (1930), No. 4, pp. 499–510*).—Data from five lysimeter studies conducted over a 15-year period at the Tennessee Experiment Station are given to show the effect of calcium and magnesium compounds on the solubility of potassium in soil and subsoil.

A 12-year study indicated that economic additions of CaO, MgO, limestone, and dolomite depressed the solubility of native supplies of potassium when the incorporations were made throughout the soil; and that 1- and 32-ton additions of CaO and MgO produced the same repressive effect even when supplemented by excessive immediate quantities of sulfates of calcium and magnesium from additions of ferrous sulfate and progressive increments of the same salts from treatment with pyrite and sulfur. A 15-year study with excessive quantities of seven forms of lime and magnesia showed (1) a decided decrease in the potassium solubility in the surface soil, and (2) a marked decrease in the solubility of potassium in the subsoil, as a result of the influx of bicarbonate-impregnated percolates. The single exception came from the 100-ton addition of CaO, and then only during the persistence of $Ca(OH)_2$.

A 4-year study with "light" and "heavy" forms of oxide and carbonate of magnesium and crystalline magnesium carbonate (trihydrate) showed the same consistent depression in potash solubility. Surface layer additions of hydrated lime, limestone, and dolomite prpoduced neutral-salt-impregnated percolates that gave some indication of potassium liberation in an underlying unlimed layer of surface soil. Subsurface layer additions produced the same repressive effect that had been obtained in the full depth treatments. When potassium additions were made by means of red clover hay along with $Ca(OH)_2$, lime-

stone, and dolomite, there was produced a decided decrease in the rate of leaching of the soluble potassium.

It is asserted that, as a whole, the results established the fact that the liming of rock-derived soils under humid conditions will depress the hydrolytic disintegration both of the original potassium complex and of that formed by the fixation of soluble added potassium salts, and further, that the protective, or buffering, effect becomes more pronounced with increase in concentration of the bicarbonates of calcium and magnesium.

The oxidation of pyrite and sulfur as influenced by lime and magnesia.—A 12-year lysimeter study, W. H. MacIntire, W. M. Shaw, and J. B. Young (*Soil Sci., 30 (1930), No. 6, pp. 443–457, fig. 1*).—The oxidation of 1,000-lb. sulfur additions of pyrite and elemental sulfur, as influenced by lime and magnesia, was studied at the Tennessee Experiment Station with ferrous sulfate control in a 12-year lysimeter experiment without subsoil, through determination of the outgo of sulfates, calcium, magnesium, potassium, and nitrates.

"Burnt lime, magnesia, limestone, and dolomite gave increases in sulfate outgo, but no 2,000-lb. calcium oxide equivalent addition gave a sulfate outgo equal to the sulfates supplied by rainfall.

"Sulfate outgo from ferrous sulfate additions corresponded to that from sulfur in the order of heavy magnesia, light magnesia, light lime, sulfur material alone, and heavy lime. The order of outgo from the pyrite was light lime, pyrite alone, heavy lime, light magnesia, and heavy magnesia. The divergent effect of lime and magnesia indicated that the organism that induced oxidation of organic soil sulfur and elemental sulfur was different from the one that produced sulfates from pyrite. The chemical oxidation of pyrite was also considered."

Other details of the findings are stated at some length.

Commercial fertilizers: Report for 1930, E. M. Bailey (*Connecticut State Sta. Bul. 321 (1930), pp. 108+XI*).—Though largely confined to the concise statement of the results of a large number of analyses of the usual type, this bulletin contains also (pp. 98, 99) the result of an investigation of the nitrogen activity of a soybean meal as compared with that of cottonseed meal and that of castor pomace. "Water-soluble nitrogen is much higher in the soybean than in the other materials. The water-soluble and the 'active' insoluble together is about 80 per cent of the total in soybean, as compared with 67 per cent and 64 per cent, respectively, in the other materials."

AGRICULTURAL BOTANY

Photoperiodic response of soybeans in relation to temperature and other environmental factors, W. W. Garner and H. A. Allard (*Jour. Agr. Research [U. S.], 41 (1930), No. 10, pp. 719–735, figs. 4*).—Four varieties of soybeans, Mandarin, Peking, Tokyo, and Biloxi, which required, respectively, 25, 55, 65, and 95 days to attain flowering when planted near Washington, D. C., in the spring, all behaved as early varieties when planted in midsummer or when planted in a warm greenhouse in midwinter; thus all but the 25-day variety (Mandarin) showed successive shortening of the vegetative stage with the advancing season. Observations on plantings of Mandarin, Peking, and Biloxi made throughout the year in a warm greenhouse showed all three to behave as short-day varieties during the period of the year when day length was 12 hours or less. Late in March the Biloxi, and about 6 weeks later the Peking, began to lengthen their vegetable periods, with no apparent change in the Mandarin variety; thus the increasing length of day affected the three varieties differently. Where day length was artificially limited to 10 hours

the lengths of the preflowering periods were rather closely correlated with average temperature. Yearly fluctuations in the behavior of any single variety are associated with temperature differences, but day length is deemed to be the controlling factor in the contrasting behavior of the different varieties.

Further studies on the relationship between the concentration of the soil solution and the physicochemical properties of the leaf-tissue fluids of cotton, J. A. HARRIS and T. A. PASCOE (*Jour. Agr. Research [U. S.], 41 (1930), No. 11, pp. 767–788, figs. 5*).—Studying the concentration of chloride and sulfate ions in the soil on the one hand and the physicochemical properties, especially the chloride and sulfate contents of the leaf-tissue fluids, on the other, there was noted, in general, a positive correlation between the salinity of the soil and the osmotic concentration as measured in terms of freezing-point depression, specific electrical conductivity, chloride content, and sulfate content of the leaf-tissue fluids of both the Pima Egyptian and Lone Star upland cottons. The relationships held whether soil salinity was measured in terms of electrical resistance or as chloride content or sulfate content expressed as percentages of the air-dry weight of the soil. No regular or universally valid difference was noted between the correlations of any of the three measures of soil salinity and tissue-fluid properties.

Admitting the preliminary nature of the study, the authors deem that it has fulfilled its purpose by confirming and extending previous results and showing that physiological investigations of this kind can be conducted in conjunction with field-plat studies. With more refined technic at many points, the authors believe that results of far greater exactness and wider significance may be expected.

Notes on the histology of the almond, V. A. PEASE (*Jour. Agr. Research [U. S.], 41 (1930), No. 11, pp. 789–800, figs. 4*).—A careful histological study, especially of the tissues surrounding the embryo, was made of the nuts of four domestic soft-shelled and four imported hard-shelled varieties of almonds. The chief difference between the two types of nuts lies in the structure of the cells of the outer epidermis of the testa, the modified epidermal cells of the soft-shelled varieties being only slightly lignified as compared with those of the hard-shelled varieties. These cells, characterized as stone cells, were longer in the hard-shelled varieties, the ratio of length to width being approximately 2 to 1 as compared with 5 to 4 in the soft-shelled nuts.

The author deemed it likely that a satisfactory method of distinguishing the different varieties in the shelled state may be developed on the basis of this work, thus preventing misrepresentation or adulteration.

Studies on the Coccaceae.—XVI, The genus Leuconostoc, G. J. HUCKER and C. S. PEDERSON (*New York State Sta. Tech. Bul. 167 (1930), pp. 80, pls. 4, figs. 10*).—Biochemical studies were made of 80 strains and a survey conducted of 86 additional strains of low acid-producing types of streptococci (Leuconostoc) isolated from slimy sugar solutions, fermenting vegetables, and milk and milk products. These isolated organisms, based on a survey of earlier work (E. S. R., 60, p. 426), apparently all belong to a single genus. A study of a series of cultures showed that all produced approximately 45 per cent of levolactic acid from glucose, 20 per cent of carbon dioxide, and 25 per cent of volatile products, including acetic acid and ethyl alcohol. They also produced mannitol from fructose and sucrose and a levulan or dextran from sucrose. Based on these observations, the organisms are placed in a single genus to which the name Leuconostoc is applied. Morphologically the members of this genus were found intermediate between the streptococci and lactobacilli. Among secondary physiological characters found useful in dis-

tinguishing species within the genus, fermentation of the pentoses and sucrose were the most constant. Three species, *L. mesenterioides*, *L. dextranicus* n. comb., and *L. citrovorus* n. comb., are described.

GENETICS

Linkage of qualitative and quantitative genes in maize, E. W. Lindstrom (*Amer. Nat.*, *63* (*1929*), *No. 687*, *pp. 317–327*).—Genetic studies at the Iowa State College involving various combinations among commercial corn varieties inbred for one generation demonstrated that number of rows on the ear, a typical quantitative character, is associated in inheritance with such simple qualitative characters as cob, aleurone and endosperm color, and endosperm texture (sugary). Evidence for genetic linkage between some of the multiple genes for row number and the genes for cob (and pericarp) color, endosperm color (*Yy*), and endosperm texture (*Su su*) was particularly convincing in certain crosses. That for aleurone color, especially the *Rr* genes, was very suggestive of a linkage. It seemed probable that genes for row number are localized on the third (sugary), fifth (*Yy* endosperm color), and sixth (cob and pericarp) chromosomes in corn and probably on the second chromosome (*R*-aleurone) as well.

Inheritance of semi-sterility in maize, R. A. Brink and C. R. Burnham (*Amer. Nat.*, *63* (*1929*), *No. 687*, *pp. 301–316*, *figs. 2*).—A further contribution from the Wisconsin Experiment Station on semisterility in corn supplements an earlier study (E. S. R., 57, p. 823) which showed that reciprocal crosses between normal and semisterile corn plants give equal numbers of normal and semisterile offspring, and that self-pollination of semisterile individuals gives a like result. To explain this behavior it is suggested that a section of one chromosome carrying genes active in the gametophyte, or an entire chromosome, has become attached to a nonhomologous member of the complement. The modified and normal chromosomes assort at random in the reduction divisions. Spores receiving the translocated section in duplicate or lacking it entirely abort, while the other two classes are functional.

The existence of a new class of normal plants, called x-normals, among the offspring of semisterile individuals was definitely established. These plants were fully fertile and gave all semisteriles when crossed with the original normal type.

Genetic notes on hybrids of perennial teosinte and maize, R. A. Emerson (*Amer. Nat.*, *63* (*1929*), *No. 687*, *pp. 289–300*).—The behavior of factors in F_1 of perennial teosinte×corn and back-crosses of the F_1 plants by corn are described and discussed in some detail from studies at Cornell University.

A fertile tetraploid hybrid between Euchlaena perennis and Zea mays, R. A. Emerson and G. W. Beadle (*Amer. Nat.*, *64* (*1930*), *No. 691*, *pp. 190–192*, *fig. 1*).—In connection with the above genetic studies of perennial teosinte-corn hybrids, a plant observed among the F_1 individuals differed markedly from its sibs and resembled in many ways the F_1 hybrids between annual teosinte and corn. An examination of root tips from this plant showing 40 chromosomes present indicated that probably the corn parent had contributed two sets of chromosomes or that one corn set had doubled after fertilization.

Hybrid intensification of plant height in cotton and the relationship of node number and internodal length to the phenomenon, J. O. Ware (*Jour. Amer. Soc. Agron.*, *22* (*1930*), *No. 9*, *pp. 787–801*, *figs. 3*; *abs. in Arkansas Sta. Bul. 257* (*1930*), *pp. 37–39*, *figs. 2*).—Certain aspects of hybrid vigor were studied at the Arkansas Experiment Station in the F_1 and F_2 of Pima (American-Egyptian)×Upright (upland) cotton and in back-crosses on both parent

varieties. The mean heights were for Pima 38.29±0.651 in. and for Upright 34.69±0.215 in., and the mean numbers of nodes were 15.85±0.402 and 11.4±0.085, respectively.

The contrast of height allelomorphs was not sufficient for the detection of dominance activity, whereas the contrast of the allelomorphs for node number was wide enough to get a measure of dominance. The axis length was much intensified in the F_1 generation, and then tended to regress, with an increase in fluctuation, to the average of the parental races. The node number assumed a position of full dominance and no intensification in the F_1 generation, diverged into the two respective groups in the sesquihybrids, and formed a unimodal distribution in the F_2 generation. The adjustments of plant height and node number, although the two characters were following different routes of inheritance, were made by the flexibility of the internodal lengths of the plants. Hybrid intensity was due to an increase in the lengths of internodes and not to additions of joints or nodes plus internodes. The author remarks that internode length seems to be influenced by a different set of factors from that of node number, or, if by factors common to both characters, one set is differently influenced by modifiers.

Hybrid vigor in oats, F. A. COFFMAN and G. A. WIEBE (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 848–860*).—The hybrid vigor exhibited in important agronomic characters in F_1 (and in some F_2) oats plants of 21 crosses between standard varieties contrasted with the same characters in the parents was studied by the U. S. Department of Agriculture cooperating with the Idaho Experiment Station.

Plant height often was increased somewhat by hybridization and panicle length was increased in some hybrids, whereas the number of tillers often was less. The total plant weight was greater than the mean plant weight of the parental strains in some crosses and less in others, although the mean of all crosses showed no marked change. Weight of straw was less in some hybrids and more in others than in the parental strains; in proportion to the total plant weight it was more often decreased than increased. Increase in grain yield often was observed in the F_1 hybrid plants, the increase averaging nearly 20 per cent. A marked increase in yield was noted also in the F_2 generation of some crosses.

Hybrid kernels appeared to be heavier and to produce more vigorous plants than kernels from plants of the parental strains, and most hybrid progeny headed earlier than plants of their parent strains. The earliness of F_1 hybrid plants seemed to render the characters culms per plant and total plant weight of little value as measures of hybrid vigor. Some of the oats strains used as parents appeared to influence their hybrid progeny more markedly than did others.

Sterility in rice hybrids, J. W. JONES (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 861–867*).—The behavior at the Biggs, Calif., Rice Field Station of F_1 and F_2 plants from crosses between Japanese and Chinese rice varieties showed the presence of a marked degree of sterility in the offspring from these crosses. In addition the development of the plants was abnormal, as was shown by the large number of F_2 plants which were so late that they failed to head and the many which headed but failed to mature seed. It was assumed that the sterility and lateness observed in the F_1 and F_2 plants are probably due to incompatibility in the chromosome mechanism which prevented normal functioning and development of the hybrid plants. The results appeared to support the view that the cultivated varieties of rice belong to two types, Japonica and Indica, which are only distantly related in descent.

Genetic relations of cotyledon color types of soybeans, C. VEATCH and C. M. WOODWORTH (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 700–702*).—The maternal green type of cotyledon color in the soybean was found to be genetically yellow in studies at the Illinois Experiment Station.

Inheritance of disease resistance in plants, H. K. HAYES (*Amer. Nat., 64 (1930), No. 690, pp. 15–36*).—The current status of disease resistance in plants is discussed as to its economic importance, genetics, and nature, and a genetic analysis of the nature of pathogenic organisms is presented. The bibliography embraces 42 citations.

The chromosomes in spermatogenesis of the goat (Capra hircus) [trans. title], I. I. SOKOLOV (*Izv. Bûiro Genetike* [*Akad. Nauk S. S. S. R.*] (*Bul. Bur. Genetics*), *No. 8 (1930), pp. 63–76, figs. 16; Eng. abs., pp. 75–76*).—From a study of spermatogenesis of the testes of one adult goat, it is reported that the diploid chromosome number is 60. The Y chromosome was identified as the smallest of the chromosomes, having a rounded dotlike form, while the X chromosome was one of the largest observed.

***The histological structure of the testes in hybrids of* Poephagus grunniens and Bos taurus** [trans. title], A. I. ZUĬTIN (ZUJTIN) (*Izv. Bûiro Genetike* [*Akad. Nauk S. S. S. R.*] (*Bul. Bur. Genetics*), *No. 8, (1930), pp. 77–89, figs. 3; Eng. abs., pp. 88, 89*).—Histological studies were made of the testes removed from two full-blood yaks, one hybrid between the yak and Kirghizian breed of cattle, and one quarter-blood yak for comparison. The results indicated that there was no difference in the interstitial cells or the Sertoli cells of the animals of the different breeds, but that the diameter of the seminiferous tubules in the hybrid was much smaller than in the purebred form and contained very few sex cells. Spermatogenesis in the half-blood yak does not go beyond the formation of spermatogonial cells, and the hybrid is therefore sterile. In the quarter-blood yak spermatogenesis proceeded further but ceased after the primary spermatocytes were formed. These findings indicate the reasons for the sterility of half- and quarter-blood yaks.

FIELD CROPS

[Agronomic research in Arkansas], M. NELSON, J. O. WARE, C. K. MCCLELLAND, G. JANSSEN, E. C. TULLIS, L. C. KAPP, J. R. COOPER, and V. M. WATTS (*Arkansas Sta. Bul. 257 (1930), pp. 17–22, 23, 24–27, 28, 29, 31–33, 34–36, 39–43, 64, 65, 66*).—The progress of variety trials with cotton, corn, wheat, spring and winter oats, rye, barley, rice, grain sorghum, sorgo, soybeans, and cowpeas; fertilizer tests with wheat, corn, oats, and clover in rotation, cotton, rice, potatoes, and sweetpotatoes; cultural (including planting) experiments with cotton, corn, oats, rice, soybeans, and alfalfa; breeding work with corn and cotton; pasture studies; and crop rotations variously fertilized and limed is reported on again from the station and substations (E. S. R., 62, p. 828).

Variety-date of planting tests with corn showed early planting best for the early Funk 90-day and later dates for Mexican June. In general, early dates were the better at the station, medium early dates at the Cotton Substation, and medium to late dates at Scott, this agreeing with previous results. Tillering differed with varieties and dates of planting; large seed in a variety produced more tillers than small seed. The tillers decreased as the number of plants per acre rose and increased decidedly with application of sodium nitrate in the drill. Benefit from removal of tillers accrued only if they were taken off when from 4 to 6 in. long. Medium deep cultivation until tasseled and also laying by deep when waist high were found superior to other cultivation methods for corn.

Interplanted legumes sown with the corn were found to make the better growth, large enough to be of value for forage, although at the expense of corn yields. However, competition with corn was not so great when the legumes were planted at a medium date in wide middles. Oats seemed to be improved after cowpeas and mung beans and affected unfavorably after soybeans and velvetbeans.

A field study of the effects of fertilizers and cultural practices on the permanency of alfalfa stands gave indications that a 12–4–4 fertilizer applied at time of seeding greatly aided the young plants in making good early growth. Phosphorus tended either to stimulate early spring growth or to improve the condition of the plant for overwintering. Plants cut continuously in the succulent stage for 1 year were reduced in stand 40 per cent compared with plants cut in full bloom or the seed pod stage, and at the end of the first season their roots averaged 26 and 74 per cent, respectively, lighter than roots of plants cut in the bloom or seed pod stage.

Study of spring tillering of winter oats revealed that plants with good space put on from 3 to 6 new tillers and those given fertilizer or considerable space in transplanting, from 7 to 12. Most of the panicles or undisturbed plants were borne by old tillers, while on plants transplanted and given space or fertilizer most panicles came from new tillers. The first border rows of winter oats plats having 8-in. alleys yielded about 25 per cent more than interior rows and second border rows 3.77 per cent more; with the 16-in. alley these increases were 52.5 and 6.87 per cent, respectively. When the area of the alley was included in the area of the plat the yields of all rows with 8-in. alleys were 5.2 per cent and with 16-in. alleys 7.1 per cent below the yields obtained from the interior rows only.

Applying fertilizer to rice after seeding seemed a better practice than application at seeding or at intervals before seeding. Increases sometimes following late application were hardly large enough to be satisfactory. Straight head of rice appeared to be associated closely with nitrogen metabolism, many sterile heads being produced by excessive nitrogen and also by green manure. It seemed probable that some incompletely oxidized compound, produced in newly submerged soils, is toxic to the plant and is removed on aeration. Addition of oxidizing agents to the soil did not relieve the condition, although from recent work calcium chloride or magnesium chloride possibly tends to reduce much of the sterile conditions. In a comparison of the two nitrogen carriers for rice, ammonium sulfate evidently tended to cause a more rapid rate of plant development in the very early seeding stages, but later the plants fertilized with sodium nitrate grew at about the same rate. Ammonium sulfate applied at the boot stage caused a marked increase in leaf and plant development over plants treated with sodium nitrate and also seemed to produce a greater percentage of sterile heads than did sodium nitrate when applied at the same stage. The safe planting period appeared to lie between April 20 and June 20. Seeding tests indicated that rice could adjust itself under varying seeding rates within a wide range, soil differences usually being more potent than seeding rates in affecting yields. Of a number of cultural and irrigation methods tested to control grass and weeds in rice, fallowing or the growing of a nonirrigated crop, as soybeans, with cultivation appeared to be most practical and economical.

The current results are detailed for cotton fertilizer tests variously conducted at Scott and at the Cotton Substation and cooperatively in different localities in the State (E. S. R., 63, p. 730), dealing with rate of application

and placement of fertilizers, variation of formulas, nitrogen sources, response to complete fertilizers and different carriers on several soil types, home v. factory mixtures, and the effects of nitrogen, phosphorus, and potassium on yield, earliness, and maturity. Spacing tests have been noted earlier (E. S. R., 63, pp. 730, 830). Station strains of Rowden, especially Arkansas Rowden 40, were outstanding in variety tests, and this was confirmed in cooperative trials, which also indicated that Acala, Arkansas 17, Delfos, D. & P. L., and Cleveland were suitable for use only in certain areas in the State, whereas Arkansas Rowden 40 seemed to be widely adapted. Cotton breeding methods used are outlined.

Potatoes showed a definite need for phosphorus on Clarksville silt loam, while the omission of either nitrogen or potassium made little difference. Gains from the use of manure showed that such soils need humus. On lighter soils, as the Orangeburg and Ruston sandy loams, a complete fertilizer was needed for maximum results, phosphorus showing the greatest returns, followed in order by nitrogen and potash. Comparisons showed a decided advantage for row applications of 5–10–5 fertilizer over broadcasting for quantities up to 1,000 lbs. per acre. The point of diminishing returns was reached on Clarksville silt loam at about 600 lbs. per acre and on the lighter soils at about 1,000 lbs. Similar observations were made in fertilizer tests with sweetpotatoes.

[Agronomic work in Mississippi, 1929], J. F. O'Kelly, C. T. Ames, and H. F. Wallace (*Mississippi Sta. Rpt. 1929, pp. 5–7, 32, 33, 34–38*).—Field crops experiments at the station and substations, continued along the same general lines as in 1928 (E. S. R., 62, p. 127), included variety tests and breeding work with corn, cotton (E. S. R., 63, p. 34; 64, p. 214), and soybeans; comparisons of grasses for pasture and winter legumes for soil improvement; and fertilizer trials with cotton. Activities of the Raymond, Holly Springs, and South Mississippi Substations have been reported on from other sources (E. S. R., 63, p. 28).

Cutting tests with soybeans indicated that late-maturing varieties, as Otootan, when not planted after May 31 should be cut for hay late in August or in September. This would result in better hay, a longer cutting period, curing with normally high temperatures, and earlier use of the fields for fall-planted crops.

In fertilizer tests with cotton under farm conditions, profitable yield increases came from the use of both phosphorus and nitrogen on prairie soils, e. g., 600 lbs. of an 8–8–0 formula. On sandier soils yields were decidedly increased by using the same quantity of 8–6–4 fertilizer. It appeared that mixed fertilizers should contain a high proportion of nitrogen.

[Crop studies in New York] (*New York State Sta. Rpt. 1930, pp. 40, 42, 47–50*).—In a method found highly satisfactory for sprouting potatoes for study, whole tubers are placed a layer deep in shallow wooden trays piled one above another within a tight wooden box with a close fitting cover. The box is placed in a room with a temperature between 60 and 80° F., and in from 3 to 5 weeks, according to temperature, the tubers will have sprouts 1 to 2 in. long. No certain method of detecting tubers affected with leaf roll has been discovered, although sprouts distinctly slender or spindling and abnormally long usually indicate leaf roll. It appeared that by discarding tubers with such sprouts, about two-thirds of the leaf roll can be removed from Irish Cobbler, but the method was less successful with the Rural and Green Mountain varieties.

The Geneva red kidney bean (E. S. R., 60, p. 433) is reported to be widely distributed over the State, with yields ranging from 4 to 145 lbs. per 2-lb.

package of seed, averaging 64.2 lbs. in 90 tests. The variety usually succeeded best on farms keeping cattle or sheep. Excessive rain, hail, and infertile soil evidently were chiefly responsible for low yields made on some farms.

The activities of the seed testing laboratory in official and routine seed testing, seed studies, and disease tests are reviewed for the year ended June 30, 1930. A cooperative drill survey in which samples of spring grains were taken from grain drills in the field demonstrated the importance of properly cleaning and treating seed grains for planting. The source of many of the seed-fouling weed seeds was shown to be in the seed used for planting. Field trials of 67 samples of seed corn taken upon the open market showed that many of the descriptive names used for varieties were meaningless, often confusing, and sometimes misleading. Unknown varieties of similar appearance sometimes were substituted for some of the more recent popular varieties of silage corn. Some lots of western corn offered as silage corn were unsatisfactory for the State. At the first frost these lots were still in the milk or soft stage and made very poor silage.

A quarter century of dry-farm experiments at Nephi, Utah, A. F. Bracken and G. Stewart (*Utah Sta. Bul. 222 (1930), pp. 44, figs. 7*).—Agronomic investigations at the Nephi Substation from 1903 to 1929, for some time in cooperation with the U. S. Department of Agriculture, included for various periods tillage and cropping experiments, variety tests with cereals, fertility studies, and rotations. Agricultural and environmental conditions in the region are described briefly, with a summary account of climatic data for the most of the period.

Fall disking of land before either fall or spring plowing decreased wheat yields. Burning of stubble returned slightly higher yields than stubble plowed under, yet burning is not advised except where conditions demand it. Yields from fall and early spring plowing did not differ much, but fell from 24 bu. from early spring plowing to 13 bu. from plowing as late as July 1. Plowing recommendations were for 7 to 8 in. deep on clay loam, 6 in. on silt loam, and 5 in. on sandy loam. Subsoiling did not appear necessary for dry lands in the region. Cultivation of fallow beyond that needed for weed control seemed without advantage. Alternation of wheat and fallow as generally practiced on the dry lands of Utah was found safer than other systems under the test conditions.

Seeding tests with winter wheat indicated planting after September 15, except where the soil was moist enough earlier, with October 1 giving the highest production. For October 1 seeding, the highest net yields came from 5 to 6 pk. Lighter rates may be advisable on silt and sandy loams. The normal 7-in. drill width outyielded wider spacing, wheat yields favored the common drill over the furrow drill, and cultivation of drill rows reduced yields compared with those not cultivated.

For reducing smut in smutty wheat formalin and copper carbonate with 50 per cent copper equivalent were found the most effective treatments. With wheat practically smut-free, copper carbonate with 18 or 20 per cent copper sufficed to control smut. Treatment with copper carbonate resulted in higher wheat yields than with either formalin or copper sulfate.

Of the varieties of winter wheat, the dominant crop on the dry lands, Kanred was currently best adapted for general seeding, although it seemed probable that selections of Turkey and various hybrids would replace part of the Kanred acreage in a few years. Baart led the varieties of spring wheat and Aurora, Black American, and Swedish Select the oats, but neither crop appeared to have a place on the dry farm, except that spring wheat may supplement winter wheat in case of winter injury. Bulgarian winter barley, although winter-

killing severely in some seasons, has equaled Kanred in weight of grain per acre.

Manure applied at the rate of 10 tons per acre in alternate years or every 4 years affected wheat yields beneficially to the extent of more than 20 per cent. When 20 tons of manure were applied in 1915 and none thereafter, residual effects were still apparent in 1929. Manure applications also resulted in higher protein content of grain. Wheat yields were not increased after peas plowed under at different growth stages for green manure and were depressed decidedly after wheat plowed under similarly to the peas. Wheat after the peas showed significant increase in protein content, especially after those turned under in the bloom and pod stages.

The average and annual yields of the crops involved in 2-, 3-, 4-, 6-, and 8-course rotations in progress for various periods are tabulated and discussed. Wheat after row crops yielded about 21 bu. per acre compared with 23.4 after fallow. The average acre yields of corn varying from 1,000 to 1,400 lbs., of potatoes from 20 to 25 bu., and of peas from 3.7 to 4 bu. were considered too small to warrant growing intertilled crops, although in localities where the total and seasonal rainfall are higher than at Nephi, it appeared that the fallow season could be used to advantage by growing one or more row crops that would fit best into a farm plan.

The effect of delayed harvest upon yield of grain, L. C. Burnett and A. L. Bakke (*Iowa Sta. Research Bul. 130 (1930), pp. 301–340, figs. 23*).—Acre yields, weights per bushel, and moisture contents of the grain were determined at semiweekly harvest intervals in 1927 and 1928 for several varieties each of oats, winter wheat, and barley. See also an earlier note (E. S. R., 61, p. 329).

Increases in yields, shown in these studies, were held to indicate that photosynthesis and translocation of food material to the kernel may continue much longer than previously reported. The yields continued to rise until the moisture content of the grain had dropped to percentages varying in 1927 between 33.6 and 10 and in 1928 between 45 and 19.4. It was evident that a considerable part of the grain crop usually is harvested before maximum production has been attained. In 1927 several varieties increased as much as 10 per cent in yield after the date of normal harvest; in some cases these increases extended over 10 days. Probably due to intermittent storms, the increases in 1928 were much smaller than in 1927, yet continued over about the same length of time. The view that the corresponding losses from delayed harvesting are lower for wheat than for other grains was confirmed. With oats a distinct relation was apparent between varieties and the length of profitable harvest period.

Development of axillary buds on fruiting branches of Pima and upland cotton, C. J. King (*Jour. Agr. Research [U. S.], 41 (1930), No. 10, pp. 697–714, figs. 12*).—The distinctions in the morphology and behavior of the axillary buds and branches on the fertile branches of Egyptian cotton and those on upland cotton are described from studies at Sacaton, Ariz., and their possible relation to cultural and to studies in bud shedding are discussed briefly.

Rudimentary axillary branches begin development in Pima Egyptian cotton with the advent of minute triangular buds in the axil of each leaf, but ordinarily this development is curtailed by the shedding or drying up of the buds, which maintain active growth for only a few days. In upland varieties the axillary buds usually remain dormant, although growth can be stimulated at any time later in the season. In Arizona axillary buds on upland plants often begin to develop late in the season, especially on luxuriant plants that have shed excessively during the summer, and a second cycle of flowering may occur on older fruiting branches. Usually the axillary buds and bolls on both types of cotton develop too late to add much to the yield.

The removal of extra axillary buds by pinching off the new buds at frequent intervals resulted in the retention of more axillary buds by the Pima plants, and many of them developed on to maturity. Similar treatment of Acala upland plants stimulated many of the axillary buds into development, and likewise many were retained until maturity. The axillary fruits that matured on defruited Pima plants were located only on the internodes developed late in the season, while on the defruited upland plants more of them matured on the internodes developed earlier in the season. Removal of the extra axillary buds caused plants to grow much taller and to produce more and longer fruiting branches than normally.

Plants of both types rendered nearly sterile during the summer from effects of the crazy top disorder have been observed to develop many axillary fruits late in the season, those on upland plants arising on both early and late developed internodes, while those of Pima formed only on the late growth.

The large numbers of very small buds shed naturally from the axillary positions on Egyptian cotton appeared to make it impracticable to use the method of collecting the shed squares or young bolls as a basis for estimating the possible crop or for assigning a proper ratio of shed buds and bolls.

Effect of irrigation water on vigor and vitality of seed potatoes, W. C. Edmundson (*U. S. Dept. Agr., Tech. Bul. 216 (1930), pp. 7, figs. 4*).—Experiments at the Colorado Potato Experiment Station with the Rural New Yorker, the leading commercial potato variety of the Greeley (Colo.) district, indicated that irrigation water has little or no effect on the vigor and vitality of seed. Irrigated seed grown under a varying number of light applications of irrigation water produced very similar yields from 1921 to 1924, inclusive. Comparisons made from 1926 to 1929, inclusive, with seed receiving different numbers of light irrigations, seed grown without irrigation, and seed grown in wet, seepy soil resulted in similar yields. Seed grown for 15 years under irrigation produced yields that were comparable with nonirrigated seed.

Fertilizer work with Irish potatoes, L. M. Ware (*Mississippi Sta. Circ. 92 (1930), pp. 4*).—Bliss Triumph potatoes were fertilized with nitrogen, phosphorus, and potassium, alone, in various combinations, and at two and three times the basic application of 1,000 lbs. of 4–10–4 fertilizer during 1929 and 1930. Nitrogen and potassium were needed most on the soil, with no benefits apparent from phosphorus. Nitrogen was the only element giving an increase when applied alone. Significant advantages came from using potassium sulfate instead of potassium chloride, but none when ammonium sulfate replaced sodium nitrate. The largest gross value ($64.41) and largest net profit ($50.76) resulted from the basic application deriving potassium from potassium sulfate. Where the fertilizer derived its nitrogen and potassium from standard materials, the largest net profit came from unit quantities of nitrogen and potassium as contained in the basic treatment without phosphorus. Doubling and tripling the basic application reduced net profits $17.35 and $54.42, respectively, per acre compared with the basic application.

The carbohydrate metabolism of Stipa pulchra, A. W. Sampson and E. C. McCarty (*Hilgardia [Calif. Sta.], 5 (1930), No. 4, pp. 61–100, figs. 16*).—Studies on material harvested from October to August on a slope near Berkeley demonstrated that the growth cycle of *S. pulchra*, a perennial bunch grass, is an orderly process characterized by periodicity, in that rapid growth alternates with depression in the growth rate. The growth of the herbage started soon after the early autumn rains. The growth rate during the winter appeared to be controlled by air temperatures, whereas that in spring and early summer was partly related to internal factors, especially the food level and the growth

habits of the plant. Stoppage of growth in the summer was evidently determined by the maturity of the herbage and might be hastened appreciably by low soil humidity. Active root growth took place in the autumn and winter when herbage growth had practically stopped. The production of flowers and seeds coincided with depression in the growth rate.

The accumulation of carbohydrate foods was observed to be related to low or to declining growth velocity and to be most active near the end of the annual growth cycle. The removal of the herbage at any time before the plant was mature was followed by more or less vigorous regeneration growth. Accumulation of carbohydrate foods was practically complete where from 43 to 50 per cent of the total annual herbage yield was produced before the peak in the growth rate. A deficiency in the accumulated food supply at the close of the annual cycle would apparently result in decreased growth during the next year.

Treatments of grazing or clipping once or twice early in the growth cycle had slight influence on the total herbage yield of this grass, although the accumulation of maximum amounts of carbohydrate foods late in the annual growth period was not prevented. If practiced between flower-stalk production and seed maturity, grazing or removal of the herbage prevented the accumulation of maximum amounts of carbohydrate foods and tended to prolong the vegetative growth. Practical conclusions were that growth should proceed with a minimum of disturbance by grazing or other forms of harvesting during the intervals of rapid growth, and that maximum utilization should follow cessation of growth and maturity of the herbage. The herbage of *S. pulchra* on the range studied retained its succulence for nine or ten months.

Hardiness and yield of winter-wheat varieties, K. S. Quisenberry and J. A. Clark (*U. S. Dept. Agr. Circ. 141* (*1930*), *pp. 31*, *figs. 2*).—The winter hardiness of varieties of winter wheat was determined from uniform nurseries grown at 30 experiment stations in the United States and Canada during two or more of the years from 1920 to 1929. Detailed data are presented for the four years 1926 to 1929, with averages for the previous years (E. S. R., 55, p. 35.)

Data on comparative hardiness obtained during 150 station years showed Minhardi, Buffum No. 17, Minturki, Odessa, and certain new hybrid strains to be consistently hardier than Kharkof, the standard used, whereas Nebraska No. 60 and Kanred were only slightly hardier, and Tenmarq, Blackhull, Superhard, and Fulcaster were tender or much less winter hardy than Kharkof.

Yields determined on surviving rows from 1926 to 1929 for a total of 57 station years showed two strains of Minhardi×Minturki, Minturki×Beloglina-Buffum, Minturki, Beloglina, and Kanred to have average yields considerably above that of Kharkof; Tenmarq, Oro, and Nebraska No. 60 to be about equal to or slightly below Kharkof; and Blackhull, Buffum No. 17, Odessa, and Minhardi to yield much lower than Kharkof.

Ways to reduce winter injury are outlined, with remarks on the characteristics of important varieties.

Wheat varieties under irrigation, L. Powers (*Montana Sta. Bul. 234* (*1930*), *pp. 42*, *figs. 6*).—The comparative yields and other agronomic characteristics of varieties of spring and winter wheat and their milling and baking qualities are described for crops from 1922 to 1928. The results apply to the higher irrigated valleys and the more favorably located higher nonirrigated bench lands.

Supreme and Marquis were indicated as the best hard red spring varieties and Federation as the outstanding white wheat. The Crimean varieties of winter wheat surpassed all others in yield and quality, Montana No. 36 of this group being recommended as the best hard red winter wheat now available for

the irrigated sections of the State. A high degree of resistance to stinking smut was shown by Montana No. 49, Ridit, Minturki, and Oro.

Yield data indicated that where winter wheat can be grown it should prove more profitable than spring wheat. Seeding tests indicated that under Gallatin Valley conditions spring wheat can not be sown too early for maximum yields. At the station where smut and foot rot were not yet a problem best winter wheat yields came from planting September 1 to 7. Plantings before September 1 usually escape smut infection, whereas those after September 15 have been less damaged by foot rot and winter injury. Timely irrigation during early growth stages, as before the early boot stage, decidedly enhanced yields.

HORTICULTURE

[Horticultural investigations at the Arkansas Station] (*Arkansas Sta. Bul. 257 (1930), pp. 36, 37, 58–64, 65, 66–71, 72, figs. 7*).—This is the usual annual report (E. S. R., 62, p. 834).

As presented by R. P. Bartholomew, G. Janssen, and V. M. Watts, the percentages of nitrogen, phosphorus, and potash in the tomato plant are apparently controlled largely by the amount of these elements in the culture medium. A deficiency of potash did, however, tend to increase the percentage of nitrogen in the plants. A large proportion of the potash and a considerable portion of the phosphorus were found to be water soluble, whereas the proportion of water-soluble nitrogen depended on the nutritive treatment. Based on dry weight, there was observed considerable translocation and reutilization of potash. Translocation and reutilization of phosphorus and nitrogen were relatively small. A very high nitrogen supply tended to decrease carbohydrate synthesis, whereas phosphorus and potash, with nitrogen excluded, tended to increase starch production. High sugar percentage in the leaves tended to promote growth, provided it was used in protein rather than starch synthesis. Growth proceeded vigorously in the presence of high total sugars, high starch, and liberal nitrogen. A balance of elements rather than large amounts seemed to favor growth, the plant being apparently able to adjust itself to a wide plane of nutrition.

J. R. Cooper and C. B. Wiggans, reporting on pollination studies with apples, assert that the failure of self-pollination is often the result of a slow growth of the tube down the style. Varieties differed in their resistance to rough treatment in pollination, Delicious being apparently highly susceptible. The vigor of the tree had a direct bearing on the vigor of the pollen. Cold weather inhibited pollen tube growth, and prolonged low but not actually freezing temperatures often prevented the resumption of normal growth. Some cases of lagging of the generative nuclei were seen in Stayman Winesap pollen. Fresh stigmas placed in the media in juxtaposition to pollen grains had no influence on the orientation of tube growth.

Working with *Lilium longiflorum* in the greenhouse, Watts observed that this species is practically self-sterile but strongly cross-fertile. Pollen tubes reached the ovaries quite as promptly in selfed as in crossed flowers. Light and temperature apparently influenced self-fertilization results.

As observed by Cooper and Wiggans, Stayman Winesap flowers apparently developed normally up to the tetrad stage. Apparent lagging of chromosomes was noted in several varieties, particularly Stayman Winesap. All degrees of sterility were observed, from a lack of development or degeneration of either vegetative or generative nuclei to a complete disintegration of the pollen grain contents. Malnutrition of the whole tree was a factor in pollen abortion, and differences were noted between flowers on different limbs of a single tree,

between single blooms on one limb, and even between the locules of the same anther. Pollen production varied from year to year in the Stayman Winesap. The female portion of the flower seemed to develop faster than the male, but under low temperatures the reverse condition was observed.

Watts succeeded in producing 100 per cent of aborted blooms on Ponderosa tomato plants grown on a well rotted manure. Watts, Janssen, and Bartholomew noted a relation between the gross nutrient supply and the proportion of xylem formed in tomato stems. Nitrogen and potash were apparently more concerned in xylem production than was phosphorus. Counts by Watts of the mitotic figures in the root tips of tomatoes grown at constant temperatures indicated that the most rapid root growth occurs from noon to dark and again from midnight to daylight. Watts observed the development of tomato pollen and concludes that it follows the parasynaptic scheme of meiosis. The abortion of tomato pollen was apparently the result of arrested development soon after the tetrad stage.

Ben Davis apples, according to Cooper and Wiggans, responded favorably to manure and commercial fertilizers, especially nitrogen. Working with young apples just coming into fruiting, no evidence was obtained that potash is of any value. Kainite did not prove harmful, as in a previous experiment. No differences were detected between the effects of various nitrogen carriers. For grapes on average fertile soils fertilizers were not beneficial, but on impoverished soils they gave good results. Some suggestion was obtained that phosphorus is valuable for grapes. Wiggans obtained such slight gains in growth of Stayman Winesap trees from applications of commercial fertilizer or manure as to render the value of such treatments for well grown trees dubious. Under poor culture complete fertilizers greatly increased growth. In the absence of fertilizer thorough culture was decidedly superior to poor culture. Mulching gave better trees than did moderate tillage. There was a distinct tendency for treatments to be cumulative.

The application of fertilizer to old strawberry beds was found by Cooper to be hazardous, since too much nitrogen reduced the stand and overstimulated vegetative growth. On certain light soils very severe injury resulted from the nitrogen carried in a 1,000-lb. application of 5-10-5 fertilizer. Phosphorus was the most important nutrient for strawberries, with nitrogen next.

As determined by Cooper and Watts, nitrogen and potash were not important in tomato growing at Fayetteville but were needed along with phosphorus at the substation at Hope. With applications below 1,000 lbs. per acre, under the row was better than broadcasting. Phosphorus was apparently the most important nutrient for cantaloupes, and supplements of lime gave good results, the basis of which could not be directly associated with pH changes. Phosphorus was the most important nutrient for watermelons at Hope, but a mixed fertilizer gave the best all-around results. At Fayetteville radishes responded to phosphorus but not to nitrogen or potash. For asparagus nitrogen was apparently the principal limiting element. Peppers responded to a complete fertilizer.

Pruning studies carried on by Cooper and Wiggans with Ben Davis apples showed a definite gain for moderate over heavy or no pruning, especially in relation to quality of fruit and the character of the tree. Winter injury followed heavy pruning of young bearing apple trees, in some cases actually killing the trees by destroying the cambium of the trunk. Wiggans noted a close relation between the number of buds, up to 150, left on grapevines and yield.

Elberta fruit buds were found less hardy by Cooper, Wiggans, and G. W. Ware than those of Red Bird, Hiley, Belle of Georgia, and some other varieties.

As noted by Cooper and Wiggans, only one plum, America, escaped winter injury to fruit buds. Cherries of the Montmorency type alone offered any commercial promise. According to Wiggans, the Concord is the leading grape in the Ozark section, with Campbell Early best in the central and southern portions of the State. Klondike and Aroma retained leadership among strawberries, according to Cooper.

As reported by Watts, staking tomatoes increased both early and total yields, while pruning reduced yields in direct proportion to its severity. No benefit was found from running a wire north and south under vegetable rows. Clipping young seedling onions resulted in reduced root growth and less stocky stems. Marglobe consistently outyielded the Norton tomato on a series of fertilizer plats.

Failure to root apple cuttings is ascribed by Cooper to the fact that buds push forth too rapidly. The wiring of apple trees had no effect on control of pests. Straw mulch reduced the yield of Klondike strawberries and delayed ripening in both the Klondike and Premier. Black paper mulch caused severe winter injury.

The desirability of staking young grape plants was shown by Wiggans in considerably longer growth of shoots of staked vines. Uneven ripening of Concord grapes was found related to pruning, there being an inverse correlation between the number of buds left and early and uniform ripening. Shading, summer pruning, defoliation, and leaf covering delayed maturity, but nitrate failed to exert any influence.

Observations by Cooper on various ornamental species suggested that the oriental forms of arborvitae are more satisfactory than the occidental for hot, dry conditions. Junipers did well when blight and red spider were controlled. *Ligustrum* and *Cotoneaster* spp. did well at both Fayetteville and Hope. Chinese arborvitae suffered winter injury at Fayetteville. A number of promising retinispora species were observed.

[Horticultural investigations at the Mississippi Station], J. C. C. Price and H. F. Wallace (*Mississippi Sta. Rpt. 1929, pp. 18–21, 38–40, 41*).—A progress report (E. S. R., 62, p. 137).

In studies of the size and age of peaches most desirable for planting, best results were secured with 12- to 18-in. June budded trees. Notes are presented on the results of variety tests with peaches, apples, pears, figs, grapes, strawberries, and sweetpotatoes. In propagation tests with the pecan, the bark graft proved best for top working, especially when used on limbs about 3 in. in diameter. Patch budding of latent buds on limbs up to 3 in. in diameter gave very promising results. The whip graft and patch bud were used in nursery propagation, with results favoring the latter.

Observations in blueberry propagation studies showed a strong periodicity in rooting, all types being highly adverse in the dormant season. Various chemicals were tested in an attempt to stimulate rooting, but with no success. The solar frame proved somewhat better than the regular propagating bench as a rooting environment. Cuttings taken from the basal portion of shoots rooted somewhat better than those higher up. Indications pointed to the fact that softwood cuttings may give better results than dormant cuttings.

Of 17 varieties of tomatoes tested at Raymond Substation, the Gulf States, Marvel, Marvana, Marglobe, Richards, Norton, and Detroit yielded the most shipping tomatoes. Based on 3 years' work, 1,500 lbs. per acre of a 5–8–3 (N–P–K) fertilizer was most profitable for tomatoes. As sources of nitrogen, nitrate of soda was most profitable in a 1,500-lb. application of mixed fertilizers, urea in a 2,000-lb. application, and in side dressings a combination of nitrate of soda and cottonseed meal gave excellent results. Tomatoes harvested from

the fertilizer plats and shipped to New York City failed to show any differences in keeping quality that could be associated with the amount of nitrogen applied to the soil. For peas a 3-10-3 (N-P-K) mixture gave the best results. Nitrate of soda proved the best source of nitrogen, and Gradus the most productive variety. With snap beans 1,000 lbs. per acre of a 3-10-3 (N-P-K) gave the most profitable yields, with ammonium sulfate and nitrate of soda competing as the most profitable sources of nitrogen. Valentine was the most productive variety.

[Horticultural investigations at the New York State Station] (*New York State Sta. Rpt. 1930, pp. 50, 51, 53, 54, 72–79, 81, 82, 83–90*).—The usual annual report (E. S. R., 62, p. 431).

A puncture tester was found effective in determining the canning quality of fresh peas, the toughness of the coat of the raw pea apparently being correlated with that of the cooked product. Toughness increased regularly with size and varied between varieties. On supplementing the puncture test with chemical analyses, it was found that puncture values should not be over 40 gm. per square millimeter, the starch-sugar ratio should not be over 1, the insoluble-soluble nitrogen ratio not over 3, and the calcium oxide content of fresh skins not over 0.06 per cent. With pea plants grown in water cultures there was observed a remarkable inverse relation between calcium and potash, the condition being most marked in the leaves and least in the skins. Tough peas were characterized by a higher calcium content. Shelled peas lost sugars and gained in polysaccharides. Sucrase, diastase, and protease were very active in macerated peas and are believed to cause deterioration in peas bruised in the viner.

A sieve was developed which enabled the isolation of inferior brands of dusting sulfurs.

Fruit breeding was actively continued with the production of some 9,000 new seedlings of tree and small fruits, accompanied by the careful study of a large number of older seedlings which had reached fruiting stage. Pruning studies with apples, pears, and plums showed clearly that low-headed, lightly pruned trees are most desirable from the point of yield and of orchard management. Plums on Myrobalan roots continued to be far superior to the same varieties on St. Julien, Americana, Marianna, and peach. The Mazzard cherry proved the best root for sweet, sour, and Duke varieties. Apple trees propagated by top grafting or top budding were quite as good as trees budded in the nursery. The productivity of the parental tree had no effect on the progeny in the case of Rome trees propagated from high and low yielding parents. Red sports, on the other hand, showed distinct superiority over the parent in respect to fruit color.

Nursery investigations covered various projects. Marked differences were found in the viability of various lots of Mazzard cherry seeds and of other fruits. Domestic supplies were generally equal or superior to foreign material. Satisfactory root branching of apple and pear seedlings was induced by close planting the first year, followed by lining out the second season. Branch root seedlings were generally superior to straight root seedlings. Winter Nelis and Bartlett pear seedlings were generally well branched. The importance of allowing plants to mature before digging was shown in the case of roses and Mahaleb cherries, where the late-dug plants survived better than those dug early. A fall freeze occurring before plants had matured caused much injury to many species, especially neglected stock. The growth of 1-year budded trees and plants was comparable to that of the stock upon which they were budded. *Pyrus calleryana* proved to be winter tender. Imported pear seedlings yielded as high as 92.5 per cent of buds. The best success was had with *Rosa*

multiflora japonica cuttings taken about August 15 and placed in a mixture of peat and sand or in sand alone. Cuttings in peat alone were too succulent. Summer cuttings proved satisfactory as lining-out stock the following spring. Autumn proved better than spring for making root cuttings of the apple.

The response of young vegetatively propagated apple trees growing in infertile sandy soil to nitrogen was found useful in interpreting the results in the orchard. It was found possible to maintain high and low planes of nutrition in trees by direct injection of nutrients.

Supplying nutrients to young tomato plants in the flat produced striking differences in the character and growth of the plants. Rather large amounts of single nutrients stunted young tomatoes, whereas complete combinations containing equal amounts did no harm and were beneficial. In field experiments, superphosphates strikingly increased the yield of tomatoes. Supplements of nitrate further increased yield, but potash was of little benefit. An application of 1,200 lbs. of 4–16–4 fertilizer per acre for tomatoes gave larger net returns than did lesser amounts. Late seeding of tomatoes with transplanting into flats proved desirable. Of several spacings tested for tomatoes, 3.5 by 4 ft. gave the largest net returns.

Some evidence was obtained that potash fertilizers increased the toughness of canning peas, a condition which was definitely correlated with high calcium content, the intake of the calcium being influenced apparently by the potash supply in the soil. Peas heavily fertilized with calcium sulfate or calcium chloride resisted root rot and produced heavy yields, as compared with half normal yields for peas which did not receive either of the above substances. Phosphorus was the principal limiting element in pea nutrition, with nitrogen in moderate amounts also beneficial. Drilling of peas and fertilizer at a single operation caused much seed injury, especially under dry conditions. Of 3, 4, 5, and 6 bu. of pea seed per acre, 5 bu. gave the largest net returns. Early planting was again found desirable.

In a test of methods of applying fertilizer to beans, it was found advisable to drill the fertilizer before seeding. Phosphorus was found the most essential element for cabbage, although nitrogen was also beneficial. Continuous cropping with either peas or tomatoes was compared with systematic rotations, much to the advantage of the rotation, especially with peas, where the crop utterly failed the fourth successive year. Vegetable varieties were studied. Vegetable breeding resulted in the development of a parthenocarpic cucumber, Geneva (E. S. R., 63, p. 138), and of a number of promising peas.

Growing sweet corn for the cannery, J. H. Beattie (*U. S. Dept. Agr., Farmers' Bul. 1634 (1930), pp. II+22, figs. 8*).—Including material on varieties by D. N. Shoemaker, on diseases by A. G. Johnson, and on insects by W. H. Larrimer, this paper presents a general discussion of sweet corn production for the canning factory, with particular consideration of the economic situation, general cultural requirements, importance of good seed, varieties, harvesting, and the use of by-products.

Relation of nitrogen fertilizer to the firmness and composition of strawberries, J. S. Shoemaker and E. W. Greve (*Ohio Sta. Bul. 466 (1930), pp. 20, figs. 3*).—That spring applications of nitrogen fertilizers have a distinct effect on the physical and chemical structure of the strawberry was indicated in studies with the Premier variety. As determined by the pressure test, the nitrogen fertilized berries were slightly softer, but the percentages of sound fruit in shipments from Wooster to Columbus failed to show any significant difference in shipping quality of fruit from fertilized and nonfertilized plats. The differences in moisture content were slight and not consistent.

Chemically, the nitrogen fertilized berries contained more nitrogen, a lower percentage of reducing sugars, and a lower percentage of total sugars in most cases, and showed fluctuating relative values for sucrose. The percentages of reducing sugars, sucrose, and total sugars increased with successive pickings. The catalase activity of both the fruit and leaves was increased by nitrogen applications. pH determinations showed less acidity in the berries of the nitrogen fed plants. Spring applications of nitrogen did not increase total yields, whereas August applications did increase yields the subsequent spring, suggesting the advisability of applying fertilizers in August, although the results secured were not such as to preclude the spring use of nitrogen when actually needed.

A chemical study of cranberries, F. W. Morse (*Massachusetts Sta. Bul. 265 (1930), pp. 87–102, fig. 1*).—Studying the changes in cranberries harvested at weekly intervals during the ripening seasons of 1926 and 1927, there was noted a rapid increase in total sugars, whereas total acid remained nearly unchanged. The highest sugar content was attained in fruits which ripened fully on the vines.

Comparable studies with several varieties in storage showed a steady loss of sugar by respiration. Total acid decreased gradually, but the tart flavor was maintained as long as cranberries remained sound.

Determinations in 1929 upon 116 lots representing 61 varieties obtained from Massachusetts, New Jersey, and Wisconsin showed wide variations in the composition between varieties and also between different lots of a single variety. In the 43 varieties from Massachusetts the average composition was 12.36 per cent dry matter, 2.3 per cent acid, 4.13 per cent sugar. In the 13 New Jersey varieties the corresponding figures were 12.03, 2.35, and 3.74, and for the 12 Wisconsin varieties 11.63, 2.41, and 3.54. Since acid varied within rather narrow limits and sugar in a wide range, it is assumed that quality is closely related to sugar content. Nine Massachusetts and one New Jersey variety equaled or exceeded 5 per cent of sugar.

Of cranberries placed in cold storage, 10 varieties had 60 per cent of sound berries on April 1, 1930, 4 varieties were half rotted by January 15, and the remaining varieties attained this condition by the end of February, indicating that commercial storage is a precarious undertaking.

Increasing the color of cranberries after removal from the vines, B. R. Fudge (*New Jersey Stas. Bul. 504 (1930), pp. 24, figs. 2*).—In part 1 of this bulletin, dealing with the effect of natural factors, it is reported that readings taken on the juice of cranberries which had been subjected to freezing showed a continual increase in osmotic pressure as ripening progressed on the vines and also some increase in stored berries. The maximum osmotic pressure developed was about 10 atmospheres. Total acidity declined slightly during the first few weeks of storage, followed thereafter by a gradual increase, reaching a maximum of about 6.1 cc. of 0.0574 N NaOH to each cubic centimeter of juice. The simultaneous increase of red color and acidity in storage suggests a relationship between the two. Sugar content of the cranberry was found to be low, the maximum being about 4 per cent, and consisted almost entirely of reducing sugars. As compared with early harvested stored fruits, vine ripened berries were higher in sugar, higher in osmotic pressure, lower in acid, and somewhat better colored. The ideal storage for cranberries was found to be from 10 to 14° C. (50 to 57.2° F.), high humidity, and diffused sunlight. In such an environment berries kept for 6 months.

In part 2 experiments on the use of ethylene for ripening and coloring cranberries are reported upon. Using ethylene gas concentrations of from 1 : 500,

1:1,000, 1:5,000, and 1:10,000 parts of gas to parts of air, no effect was noted of the gas upon the red pigment of cranberries, but it did destroy the chlorophyll, the amount of which was, however, so slight as to render the effect of the ethylene treatment of little moment. Chemical changes in sugars and acids during the process were not sufficient to justify the use of ethylene. Respiration changes due to ethylene were small, reaching a maximum at the highest temperatures utilized and leading to the statement that under all conditions temperature was considerably more effective than the gas in stimulating respiration.

Experiments on the processing and storing of Deglet Noor dates in California, A. F. Sievers and W. R. Barger (*U. S. Dept. Agr., Tech. Bul. 193 (1930), pp. 24, pls. 2*).—A rapid increase in the production of Deglet Noor dates in California made desirable studies of methods of handling and storing a portion of the crop. Cane sugar found in large amounts in this variety of date was upon maturity of the date gradually inverted into reducing sugars, with the result that dates left on the tree after maturity was reached lost flavor, becoming sirupy through excessive inversion. Accompanying the sugar change the skin turned from a rose or deep pink to cinnamon or hazel color, the flesh softened, and the astringency was lost by the deposition of the tannin in an insoluble, tasteless form.

The authors established the fact that comparatively immature dates may be successfully ripened artificially, but that the varying degrees of maturity existing in the fruit of a single cluster or even of a single strand required careful grading of the product prior to processing. At temperatures of 95° F. or less dates were brought to the desired color and texture without serious loss in flavor or excessive inversion of the sucrose. With reducing sugar content below 25 per cent and moisture at about 25 per cent, the dates were attractive in appearance and of normal flavor and texture.

In storage studies processed and unprocessed dates were held at 32°, 50 to 60°, and 60 to 70° in bulk and packages to determine the best temperature for storage. Because of the rapid inversion of sucrose at the higher temperatures, 32° proved most satisfactory, partially mature or partially processed dates keeping from 9 to 10 months at 32°, with fully ripe or completely processed fruit keeping from 5 to 6 months. Pasteurizing trials did not yield conclusive results. Freezing storage appeared practical for the riper grades of dates, but 32° was adequate for the slightly immature fruits.

Fertilizers for pecan soils, J. J. Skinner (*U. S. Dept. Agr. Leaflet 71 (1930), pp. 8, figs. 4*).—A general discussion of the pecan nutrition problem, presenting a constructive program of soil management and citing results obtained in fertilizer studies on various soil types to show that applications of commercial fertilizers have been generally highly profitable. Good soil, green manuring, proper tillage, and correct fertilization are given as important factors in the successful production of pecans.

Hardy woody plants, F. A. Waugh and C. H. Thompson (*Massachusetts Sta. Bul. 267 (1930), pp. 147–182, figs. 2*).—Beginning with a brief history of tree and shrubbery plantings on the college campus and a summation of data on temperature and rainfall during the period 1889–1928, notes are presented on the behavior and adaptability of the many woody species grown and studied during this long period.

FORESTRY

[Forestry at the Arkansas Station], R. P. Holdsworth (*Arkansas Sta. Bul. 257 (1930), pp. 71, 72*).—Observations on the periodicity of root growth of various forest trees showed no cessation during the seven growing months.

Shoot growth of *Quercus lyrata* and *Q. macrocarpa* ceased within three months. Top growth of the shortleaf pine ceased in early spring to be resumed later in the growing season. Increasing the amount of moisture applied to tree seed beds increased germination. The amount of moisture in beds receiving 50 per cent more water than natural precipitation was apparently optimum for all species except *Taxodium distichum*, which apparently required a somewhat higher water supply.

Dry-land shelter-belt tests at the Judith Basin Branch Station, I. J. Jensen and F. M. Harrington (*Montana Sta. Bul. 233 (1930), pp. 27, figs. 14*).—From observations on tree plantings made in 1912 and later, the authors report that boxelder, caragana, green ash, and American elm were the most desirable species, with the suggestion that Chinese elm and Russian olive might well be added. Spacing trees from 4 to 6 ft. in the row and rows 10 ft. or more apart is recommended. The mixing of several species in a plantation is deemed desirable. Clean cultivation was most satisfactory in respect to growth and survival. Severe pruning was not found advisable, and single trunks were most satisfactory. Shelter belts held the drifting snow, and in the case of narrow belts the snow was deposited just beyond the tree area and served as a valuable source of water for the garden or the orchard.

Dry-land shelter-belt tests at the Northern Montana Branch Station, F. M. Harrington and G. W. Morgan (*Montana Sta. Bul. 235 (1930), pp. 16, figs. 5*).—Established in 1917, the first of three extremely dry years, the shelter belt plantation discussed in this bulletin was successfully maintained and demonstrated that shelter belts are possible on practically all farms in Montana. Among observations made were that small nursery trees are more certain to survive, that close planting not only failed to suppress weeds and grass but prevented maximum growth, that summer fallowing the year preceding planting was distinctly helpful, that alternate rows of quick and slow growing species was not desirable in close plantings because the rapid species suppresses the slow, and that young evergreens need shading for a year or two. The American elm, Chinese elm, green ash, and boxelder, and the jack pine, yellow pine, and spruce are all deemed desirable species. The shelter belt was found useful in protecting fruit trees from winter injury and by collecting snow in promoting better moisture conditions.

Current growth in Norway pine, T. Schantz-Hansen (*Jour. Forestry, 29 (1931), No. 1, pp. 48–53, fig. 1*).—Studies by the Minnesota Experiment Station in a mixed stand of Norway and jack pines approximately 100 years of age showed that Norway pine had consistently increased in net volume since 1913, the date of the first measurements, whereas the jack pine had actually decreased. The increase in the Norway pine was, however, not equal to the decline in the jack pine. For Norway pine the estimated growth in mean annual board feet at 88, 93, 98, and 103 years of age was 123, 152, 139, and 136, respectively. Periodic annual growth apparently culminated at from 70 to 80 years of age.

Selective girdling of hardwoods to release young growth of conifers, M. J. Plice and G. W. Hedden (*Jour. Forestry, 29 (1931), No. 1, pp. 32–40, fig. 1*).—Growth records taken in seven typical softwood areas in the Adirondack Mountain region showed a steady increase in growth of the released softwood trees following the girdling of the hardwoods, whereas before this operation growth was practically at a standstill. The slow death of the girdled hardwoods and their gradual decay allowed opportunity for the spruce and balsam to become wind firm. The order in which hardwoods succumbed to girdling injury was (1) white birch, (2) yellow birch, (3) red maple, (4) hard

maple, and (5) beech. The physiology and pathology of girdling is briefly discussed.

Skeleton planting, E. STAFFORD (*Jour. Forestry, 29 (1931), No. 1, pp. 41–47*).—A discussion of a planting plan employed on the Swann Forest in southwestern Massachusetts in which only those trees that are intended to form the permanent stand are planted, the intention being to encourage brush to grow temporarily among the trees, removing it in time to prevent injury to the permanent planting.

Suggestions for the management of spruce stands in the Northeast, M. WESTVELD (*U. S. Dept. Agr. Circ. 134 (1930), pp. 24, figs. 12*).—A general discussion pointing out that spruce stands may be differentiated into five main types, namely, the spruce flat, spruce hardwoods, spruce slope, spruce swamp, and old field spruce. Recommendations are made concerning cutting methods, protection of young advanced growth, control of the stand composition, disposal of slash, etc., that would favor maximum production of lumber of the desired species.

The improvement of yield in Hevea brasiliensis, F. SUMMERS (*Singapore: Kelly & Walsh, 1930, pp. VII+198*).—A comprehensive discussion of recent work in the development of high producing clons of the Hevea plant, with information on methods of budding, the choice of stocks, the determination of high yielding individuals, etc.

Tung oil in the Yangtsze Valley, F. A. MCCLURE (*Lingnan Sci. Jour., 9 (1930), No. 3, pp. 233–265, pls. 8, fig. 1*).—A general discussion laying particular stress upon species, cultural practices, methods of extraction, and utilization.

DISEASES OF PLANTS

Plant pathology [at the Arkansas Station] (*Arkansas Sta. Bul. 257 (1930), pp. 72–85, figs. 6*).—In cultures grown from organisms found on rice kernels, fungi were identified by E. C. Tullis as of the following genera: Alternaria, Dactylaria, Helminthosporium, Phyllosticta, Fusarium, Protascus, and Penicillium. In addition there were many cultures of a nonfruiting pycno-sclerotial form, which is not deemed pathogenic. The high mortality caused by the several pathogenes was evident, as only 9.2 per cent of the plants from infected seed of six varieties grew when sown in the greenhouse.

Stem rot of rice was found by Tullis to have an optimum growing temperature of from 27.5 to 30° C. (81.5 to 86° F.), a minimum of from 11 to 15°, and a maximum of from 32.5 to 35°. As concerned acidity reaction, the amount of growth produced per day on corn meal agar increased from pH 4.05 to 6.1 with no decided difference above this point. The organism produced no acid on various sugar media but did slightly liquefy nutrient gelatin. Stem rot of rice was found to be quite severe in certain localities in Arkansas and elsewhere. The drainage of an infected field just before and during the boot stage greatly increased the yield.

Cotton-wilt studies conducted by V. H. Young, J. O. Ware, and G. Janssen consisted in the isolation of wilt-resistant strains, combining resistance and desirable commercial qualities. Super Seven, D. & P. L., Arkansas 17, and Express 121 were satisfactory long-staple varieties, and Arkansas Rowdens 40 and 2088, Miller, and to a less extent Arkansas Rowden 2119 and Cleveland 54 were desirable medium-staple varieties. For short-linted kinds Dixie Triumph and Dixie 14 were desirable, except in regions of short summers or where boll weevils are plentiful, and Wilson Big Boll, less resistant to wilt, ripened earlier. Some indication was obtained that potash may reduce wilt injury, and thicker stands were apparently desirable in wilt-infected soils.

As determined by Young, low temperatures prevailing in April and May prolonged the incubation period of *F. vasinfectum*, the cotton-wilt fungus, the low soil temperatures apparently determining the development of the wilt. Dry soils evidently prevented cotton-wilt development in later plantings.

Studies by Young of another wilt organism, *Verticillium alboatrum*, showed a wide range of adaptability to soil reactions, since no significant differences in the rate of growth on corn meal agars ranging from pH 4.5 to 9 held at a constant temperature of 25° were noted.

Applications of copper-lime dusts to cantaloupes to control leaf blight and downy mildew slightly reduced yields, apparently as a result of foliage injury, coupled with the fact that little disease occurred due to drought.

Grape spraying experiments conducted by Young indicated that the present program to control black rot (*Guignardia bidwellii*) is adequate, provided the sprays are properly timed and thoroughly applied. No advantage resulted from the use of two preblossom sprays as compared with the usual one spray at this stage.

Work with various disinfectants for seed corn led Young and C. K. McClelland to conclude that dust treatments may be of benefit with early plantings when the seed is exposed to adverse soil temperatures but that no benefit will accrue from the treatment of seed for medium or late season plantings.

Pear blight studies are again reviewed by Rosen (E. S. R., 62, p. 444) and lead to the conclusion that the destruction of pear trees will not result in freeing susceptible apples from blight, since both the apple and the pear serve as overwinter hosts of the disease.

Studies by Rosen of the nature and causes of tip and margin burning of potato leaves showed little difference between sprayed and dusted plants on the one hand and controls on the other in respect to this injury. Records showed a precipitous drop in air temperature immediately following spray applications in the afternoon, whereas those applied early in the morning produced no such phenomenon.

Annual report of the department of plant pathology, L. E. Miles (*Mississippi Sta. Rpt. 1929, pp. 22–27*).—As the result of studies at several places, it is concluded that adequate nutrition and the use of resistant varieties are important factors in reducing cotton-wilt losses. A balanced condition between the nitrogen and potash contents of the fertilizer was found desirable. A number of resistant varieties were discovered.

Treating cottonseed with disinfectants gave promising results at the Holly Springs, Raymond, and South Mississippi Substations, but at Scott no significant differences were observed in germination, seedling diseases, or yield. Potash was beneficial in offsetting the harmful results of rust, generally causing a decrease in defoliation and an increase in yield.

No appreciable benefit from the treatment of corn seed with various organic mercury compounds having been noted, the project was abandoned.

Observations on a large number of oat varieties and selections for resistance to blast showed a range of from 3.24 per cent of blast on Kanota to 48.04 per cent on Iowa 102.

Comparisons of sulfur-hydrated lime dust with various sulfur sprays for the control of peach scab gave evidence in favor of the liquids.

Observations on Burpee Stringless Green Pod beans grown from seed obtained from several sources showed a range of from 8 to 29 per cent of mosaic.

Tests of resistant strains of Jersey Wakefield cabbage obtained from the University of Wisconsin showed one lot (2027B) to be highly resistant to yellows and to be early and uniform in maturity.

Comparisons of various organic mercury compounds with mercury bichloride and formaldehyde as disinfectants for scabby potatoes did not show the organic mercury materials to be superior to mercury bichloride nor to have any influence on germination or yield.

Of 19 tomato varieties tested for resistance to wilt, Louisiana Red and Louisiana Pink ranked near the top, considering both resistance and yield.

Of the disinfectants tested for the treatment of gladiolus corms, mercuric chloride was found to be the best, but Uspulun was also satisfactory. The removal of the husks was unnecessary, and treatments up to 32 hours in length caused little injury. An 8-hour immersion in 1–1,000 mercury bichloride solution is recommended.

Mercuric chloride was also found an excellent disinfectant for narcissus bulbs showing root rot.

[Plant pathology at the New York State Station] (*New York State Sta. Rpt. 1930, pp. 40–42, 43–47*).—Simulating in the greenhouse outdoor soil conditions at different seasons and checking the results with field observations, it is concluded that the soil is contaminated with various pathogenic organisms, which, under cold, wet conditions, become a menace to the pea plant. The Yellow Admiral variety was apparently more sensitive to unfavorable conditions than was the Alaska variety.

Some indication was seen that spraying of tomatoes may delay ripening to a harmful degree.

Investigations on bean mosaic indicated that the use of disease-free seed is the only certain means of control.

Mild mosaic in the black raspberry was found to be an expression of some of the symptoms of red raspberry mosaic. Susceptible black raspberries, such as Plum Farmer, showed a very high correlation between mild mosaic and the later development of recognizable red raspberry mosaic symptoms. The failure to transmit mild mosaic experimentally prevented the drawing of final conclusions. Yellow mosaic spread more slowly in Plum Farmer and Cumberland than did red raspberry mosaic but quickly killed the affected plants, thereby apparently limiting its rate of spread. Mild streak spread very slowly in Plum Farmer and Cumberland and rapidly in Ohio. Severe streak and leaf curls were not found in the experimental plantings.

Observations in a variety and seedling plantation of red raspberries indicated that Cuthbert contributed susceptibility to yellow mosaic when crossed with Newman and Herbert. June also transmitted susceptibility to the June×Herbert seedlings. Seedlings from the Herbert×Newman crosses were practically free or showed resistance to yellow mosaic. In one cross 12 seedlings were free, 1 resistant, and 1 moderately susceptible. Of 42 seedlings containing Newman as a parent, 86 per cent were free from yellow mosaic after three seasons, whereas only 56 per cent of 25 seedlings with Cuthbert as a parent were free.

Concerning the nature of the injurious effect of sulfur to foliage, evidence was secured that sulfur injures the cuticle and predisposes the leaf to excessive transpiration, which under conditions of water shortage may kill the leaf.

Dusting the cut seed potatoes with gypsum and sulfur and allowing them to be in storage for four weeks prior to planting caused serious injury to the resulting crop in stand and in yield. Two weeks or less in storage following dusting caused no injury. Certain dusts were found which were not harmful.

The best treatments developed for the control of bacterial wilt disease of the cucumber were a spray consisting of Kayso and calcium arsenate and a

monohydrated copper sulfate, calcium arsenate, and hydrated lime dust. A weak Bordeaux mixture 1.5–3–50 stunted the vines, although controlling the disease.

Control of fungus diseases [of plants] (*West Indies Imp. Dept. Agr., St. Lucia Agr. Dept. Rpt. 1928, pp. 10–13*).—This portion of the report deals briefly with lime blossom blight and withertip; cacao Rosellinia root disease and pod rot; and coconut bud rot (*Phytophthora palmivora*), stem bleeding disease, leaf yellows and withering leaf (malnutrition), little-leaf disease, bitten leaf disease, and senility.

Studies on the Helminthosporium diseases of Gramineae in Japan [trans. title], Y. Nisikado (*Ohara Inst. Agr. Research, Spec. Rpt. 4 (1928), pp. IV+384+6+11, pls. 62, figs. 41; Eng. summary in Ber. Ōhara Inst. Landw. Forsch., 4 (1929), No. 1, pp. 111–126, pls. 9*).—The original paper, in Japanese, gives a detailed account of this study and its results, with technical descriptions of the new species, *H. tritici-vulgaris*, *H. panici-miliacei*, *H. yamadai*, *H. brizae*, *H. coicis*, *H. miyakei*, and *H. zizaninae*, besides accounts of *H. leptochloae* and *Ophiobolus kusanoi*, said to have been described previously, and a bibliography of 252 titles.

The second account, in English, comprises a briefer presentation, including, however, a somewhat detailed outline of the contents of the original Japanese paper, with a summary of results in some detail and with diagnoses of six Helminthosporiums as new species, along with mention of *H. tritici-vulgaris*, *H. leptochloae*, and *O. kusanoi* as previously described. Twenty-four species of Helminthosporium parasitic on 8 species of cereals and 18 species of wild grasses are said to have been studied on their hosts and on culture media. The 7 types or sets of symptoms which were separated out were classified as leaf stripe, leaf spot or eye spot, net blotch, leaf blight, foot rot, sooty heads, and black knots. It is thought proper to divide these cereal-attacking species of Helminthosporium into the subgenera Eu-Helminthosporium and Cylindro-Helminthosporium, of which forms diagnoses are given.

[Report of] botanical division (*Mauritius Dept. Agr. Ann. Rpt. 1928, pp. 10–13*).—Sugarcane diseases reported include leaf scald (*Bacterium* sp.), gummosis (*B. vascularum*), red rot (*Colletotrichum falcatum*), pineapple disease (*Thielaviopsis paradoxa*), smut (*Ustilago scitamineae*), streak, a root disease complex (cause obscure), pokkah hoeng, eye spot (*Helminthosporium* sp.), and stem deterioration (bacterial?); tobacco mosaic, frenching, mildew (*Oidium* sp.), Granville wilt (*B. solanacearum*), house burn (moisture), and filao (*Casuarina equisetifolia*); coconut bitten leaf (*T. paradoxa*); royal palm (*Roystonea regia*) bud rot (*T. paradoxa?*); *Terminalia arduna* root disease (Basidiomycetes in soil?); cucurbitaceous mosaic; *Cassia occidentalis*, *Cassia* sp., and *Hytarpheta indica* mosaic; *Panicum maximum*, *Stenotaphrum complanatum*, and *Fimbristylis monostachya* smut; *Paspalum dilatatum* ergot (*Claviceps paspali*); tomato bacterial wilt (*Bacterium solanacearum*), a tomato disease; potato leaf roll (?) and blight (*Phytophthora infestans*); cruciferous (cabbage and cauliflower) black rot (*Pseudomonas campestris*); pea leaf spot and stem rot (*Ascochyta pisi*); carrot blight (*Cercospora* sp.); citrus collar rot (bacterial?); and maize streak disease (corn stripe disease?).

Conidial fructifications in Balansia and Dothichloe, W. W. Diehl (*Jour. Agr. Research [U. S.], 41 (1930), No. 11, pp. 761–766, pls. 2, figs. 3*).—Studies conducted by the Bureau of Plant Industry, U. S. D. A., showed certain conidial fructifications hitherto unknown or rarely recognized developing in a similar manner in *B. hypoxylon* and in known species of Dothichloe, fungus parasites of certain grasses. An amerosporous conidial fructification similar to that of Epichloe is reported for two species of Dothichloe and for *B. hypoxy-*

lon, and an effuse conidial fructification microscopically similar to the Ephelis stage of Balansia is reported for Dothichloe. Branched conidiophores are reported in the Ephelis fructifications of *B. hypoxylon*, in *E. mexicana*, and in the scolecosporous fructifications of Dothichloe. The character and sequence of the conidial fructifications in Balansia and in Dothichloe are such as to commend their recognition in the taxonomic interpretation of these fungi.

Methods of eradicating buckthorn (Rhamnus) susceptible to crown rust (Puccinia coronata) of oats, S. M. DIETZ and L. D. LEACH (*U. S. Dept. Agr. Circ. 133 (1930), pp. 16, figs. 6*).—In discussing the occurrence and distribution of species of Rhamnus known to be susceptible to crown rust of oats, two species, *R. cathartica* and *R. lanceolata*, were found to be very abundant in the Mississippi Valley, the former in the upper portion and the latter species in the middle and lower portions. Of the methods of eradication tested on plants of *R. lanceolata*, it was evident that salting was preferable in the spring because of its comparatively rapid killing at that season. Kerosene applications in the spring were slow to kill, allowing opportunity for the development of an abundance of aecia under favorable conditions. Kerosene applied in the summer was highly effective, 5 qt. killing even the largest bushes. The removal of the crown was the cheapest and most effective lethal treatment but involved considerable manual labor. Felling, followed by a light application of either kerosene or salt, was also effective. Although no comprehensive eradication experiments were conducted with *R. cathartica*, the authors deem it probable that the methods of control as outlined will also be applicable.

[**Cotton diseases, Egypt**] (*Egypt Min. Agr., Cotton Research Bd. Rpt., 6 (1925–1927), pp. 71–74*).—In this portion of the report of the plant protection section, Fusarium disease is said to have been under study since 1920. A short account of the disease is given, with reference. The wilt organism is said to have been identified as *F. vasinfectum egyptiacum*, and to have been found to differ from the organisms causing a corresponding disease in the United States and one in India, mentioned, respectively, as *F. vasinfectum* and the Indian Fusarium.

The control effects of bare fallow and of carbon bisulfide had little economic value, but in 1923 selection experiments were begun and by the end of 1926 four strains of resistant cotton had been isolated. In 1927, work was commenced on the pure line propagation of the four resistant strains in heavily infected soil and on the grading of the bulk lint of each strain. Four new strains were selected in 1927, one of which, known as strain E, is said to be very promising.

Sore-shin studies carried out are also reported, including seed disinfection and factors affecting seed germination and seedling growth. Among the numerous factors tending to cause cotton sore-shin, temperature and soil conditions rank high, in association with soil organisms of which Rhizoctonia is perhaps the most important. It proved possible to control the disease sufficiently to reduce the resowing by using, principally, Uspulun, Abavit, and Germisan, though such dressing is valueless if the temperature is constantly below normal during germination and the greater portion of the growth period of the seedling.

Fruit diseases in 1928, H. W. ANDERSON (*Ill. State. Hort. Soc. Trans., 62 (1928), pp. 126–135*).—An account is briefly detailed regarding diseases of apple, pear, peach, and various small fruits, preceded by a review of 1928 climatological factors.

Experimental spraying and dusting for fruit disease control, 1928, H. W. ANDERSON (*Ill. State Hort. Soc. Trans., 62 (1928), pp. 136–156*).—It is concluded that the earlier recommendations for spraying (E. S. R., 51, p. 40)

and those herewith (pp. 37–63) constitute a safe guide to the fruit grower as regards the control of insect pests and fruit diseases. Any modifications should be undertaken on a small scale, the results to be checked against the standardized practice.

Investigations on chlorosis of fruit trees, II–IV, T. WALLACE (*Jour. Pomol. and Hort. Sci., 7 (1928), No. 3, pp. 172–183, 184–198; 7 (1929), No. 4, pp. 251–269*).—This is a continuation of the work previously noted (E. S. R., 57, p. 750).

II. *The composition of leaves, bark, and wood of current season's shoots in cases of lime-induced chlorosis.*—It is stated that, since the publication of the results above referred to, the conclusions have been tested in many cases over two further seasons and that in every case they have been confirmed; also that examination has been made of samples of chlorotic foliage in case of the susceptible pear, plum, and raspberry, and that the investigation has been extended to analysis of the current season's shoots in certain cases.

In lime-induced chlorosis of the apple, pear, plum, and raspberry, the chlorotic leaves show a higher percentage of ash in dry matter, with a lower percentage of calcium and a higher percentage of potassium in the ash. The bark of the current season's shoots of the apple, pear, and raspberry bearing chlorotic leaves also shows high ash in the dry matter, low calcium, and high potassium in the ash. In the wood of such shoots, the ash in dry matter is again higher in the chlorotic samples, but the relationships which hold for calcium and potassium in the leaves and bark are not found, the results being indefinite. The iron content of the leaves of chlorotic samples is not consistently lower than is that in those of comparable green samples; and in bark and wood it is usually higher in the chlorotic samples.

III. *A chlorosis of plums due to potassium deficiency.*—A chlorosis of plum trees, which has been observed in many commercial plantations, is said to be due to potassium deficiency. It is claimed that this particular chlorosis of plum trees is developed where the soil conditions appear conducive to leaf scorch in apple, gooseberry, and other fruit trees. Data are presented as to plantation details, soil characters, and other features.

The foliage data show that chlorotic leaves contain low ash in dry matter, high iron, calcium, magnesium, and phosphorus, along with low potassium, in ash. These characteristics of the chlorotic leaves furnish a means of distinguishing the particular chlorosis from lime-induced chlorosis where ash in dry matter is high, calcium low, and potassium high in the ash in chlorotic samples. The data from two centers are thought to suggest that water-logging may induce potassium starvation in plum trees.

IV. *The control of lime-induced chlorosis in the field.*—In cases of lime-induced chlorosis, it has been shown that these trees were on soils containing high calcium carbonate and that the foliage and stem portions of the terminal shoots of the chlorotic specimens showed in all cases definite and similar characteristics in the composition of the ash. It was also noted that the particular chlorosis studied has been associated with deficiency of iron, since the chlorotic foliage could be changed to a normal green by painting or spraying solutions of ferrous sulfate on the leaves. Experimentation seeking methods of control on a commercial scale progressed during four seasons, the experiments having been confined, with one exception, to determining the value of sprays and of cover crops as effecting commercial control. The results show that while spraying methods do not appear adequate, cover crops apparently provide a suitable and cheap means of effecting considerable control over the condition.

It is stated that the action of ferrous sulfate sprays is uncertain as regards control of lime-induced chlorosis of fruit trees associated with iron deficiency. Such sprays sometimes produce good and, at other times, inadequate results, and considerable damage occasionally results from their use. Aluminum sulfate spray gives no control. The plan of growing permanent cover crops over the root systems of affected trees appears to be of considerable commercial value.

The Aspergilli and their relation to decay in apples, G. A. HUBER (*Jour. Agr. Research* [*U. S.*], *41* (*1930*), *No. 11, pp. 801–817, figs. 17*).—Eleven forms of Aspergillus isolated at the Washington Experiment Station from previously sterilized water used in washing apples are technically described and classified into form groups. Seven of the isolated forms caused decay when inoculated into fresh apples under favorable conditions. At 0° C. none of the forms initiated decay. At from 10 to 12° three of the forms caused decay, and at from 18 to 22° these three and four others caused rotting. The types of decay caused by the several forms of Aspergillus varied greatly from firm and moist rots to dry and somewhat corky rots. One of the seven, *A. niger*, caused a very soft and watery rot.

In culture the several forms developed more rapidly in storage at from 18 to 22° than at from 10 to 12°. No growth appeared in any of the forms at 0°.

A disease of the strawberry plant, T. SMALL (*Jour. Pomol. and Hort. Sci.*, *7* (*1928*), *No. 3, pp. 212–215, pls. 2*).—The discovery in 1925 of *Diplodina lycopersici* causing a disease of strawberry plants under glass and later occurrences of the disease in the open led to the investigation which is here outlined.

Cross inoculation showed that the fungus causes a stem canker in tomato, cucumber, and tobacco. Inoculations of strawberry plants with a strain of *D. lycopersici* from diseased tomato fruits caused symptoms of the typical strawberry disease. Though all parts except the crown are susceptible, infection occurs usually in those parts in contact with the soil, the chief source of infection. The disease is favored by deep planting and cool, wet conditions. Control measures recommended include sterilization of the soil with heat where practicable; destruction of diseased plants, tissue, and once-used straw; and the planting of stock known to be clean.

Fungi occurring in cacao beans, R. H. BUNTING (*Gold Coast Dept. Agr. Bul. 16* (*1929*), *pp. 44–57, pls. 6*).—The author states that one of the most frequent defects of export cacao is the presence of deteriorating mold on the embryo of the prepared beans. He divides cacao bean molds, from the practical point of view of preparation, into three sections according to the conditions in which they are found. The forms, groupings, and occurrences are briefly discussed.

Further notes on cushion canker of cacao, H. A. DADE (*Gold Coast Dept. Agr. Bul. 16* (*1929*), *pp. 135–138, pls. 2*).—These notes are said to be supplementary to the account previously noted (E. S. R., 61, p. 847). See also below.

In 1928, 200 inoculations with *Phytophthora faberi* were made to study the course of the cushion canker. In half of these cases the parts were dissected at intervals; the other 100 were left for dissection a year later. The developments observed are shown diagrammatically, with discussion in some detail, and a summary of the assumed full history of cushion canker.

Origin and spiral arrangement of cushions in cacao, H. A. DADE (*Gold Coast Dept. Agr. Bul. 16* (*1929*), *pp. 147–150, pls. 3*).—Noting with approval a statement by Van Hall (E. S. R., 32, p. 745) that the cacao cushion must be regarded as a branch, and pointing out that the persistent basal parts are analogous to the spurs in the case of noncauliferous fruit trees, the author

discusses the course of cacao cushion canker in connection with matters of physiological significance.

The non-toxicity of the secretions of Phytophthora faberi Maubl, J. J. OBENG (*Gold Coast Dept. Agr. Bul. 16 (1929), pp. 139, 140, pl. 1*).—An investigation undertaken at the suggestion and with the assistance of Dade (see above), indicated that the substances secreted by *P. faberi* have no toxic action on the tissues of cacao pods.

Variations in the percentages of cacao crop lost through pod diseases, H. K. HEWISON (*Gold Coast Dept. Agr. Bul. 16 (1929), pp. 130–134, pl. 1*).—In view of data and statements by Dade, as previously noted (E. S. R., 60, p. 245), the present author offers further figures, with analyses, which are considered significant for the study of the cacao plant in its growth and in its reproduction, as well as in its bearing.

Defective cacao, R. H. BUNTING (*Gold Coast Dept. Agr. Bul. 16 (1929), pp. 37–43, pls. 3*).—"This paper is an attempt to standardize defective beans in the hope that it may help to correlate defects with their causes. . . . The results illustrated on the accompanying plates have been obtained by deliberate exposure to such conditions as were considered to be causative of the effect shown. All cases mentioned and illustrated refer to the common variety grown in this country—Amelonado."

Internal moulding of prepared cacao, H. A. DADE (*Gold Coast Dept. Agr. Bul. 16 (1929), pp. 74–100, pls. 13*).—The controlling factor in cacao internal molding is water content. The most common fungus in "commercial mold" is *Aspergillus glaucus*, which produces this commercial molding in cacao at a lower water content than the other fungi involved. The critical water content percentage for molding is, therefore, that which will allow the development of *A. glaucus*. As this is between 8 and 9.5 per cent, 8 per cent is the upper limit of safety as regards *A. glaucus*.

Conditions permitting molding occur during fermentation, during drying if protracted by rain, during storage at high atmospheric humidity, and during handling and transport in case of access of rain or of sea water. Injuries to the "shell" from husking knives, by insect pests, and through cracking in very dry cacao admit molds.

Owing to the susceptibility of the testa opposite the radicle, due supposedly to changes brought about by enzymatic action during incipient germination in the early stages of fermentation, *A. fumigatus*, *A. glaucus*, and supposedly Mucor 463, the most important as regards internal molding, can penetrate the testa in this region. *A. fumigatus*, being able to penetrate the testa during fermentation, and *A. glaucus*, being able to penetrate the testa and to cause molding at a lower degree of water content than any of the other fungi concerned, are more important than any others, though such other fungi often overgrow the ones named when the retained water content is high. Supposedly *A. fumigatus* and *A. glaucus* favor penetration by other fungi. Internal infection by other molds occurs in delayed drying.

A storehouse having an average daily humidity of over 82 per cent is unsafe for the prolonged storage of cacao.

The treatment of tea root diseases, C. H. GADD (*Trop. Agr. [Trinidad], 6 (1929), No. 4, pp. 107–109*).—This account deals briefly with Diplodia root disease (*Diplodia* sp.), brown root disease (*Fomes lamaoensis*), Ustulina disease (*U. zonata*), and the rapidly spreading Poria disease (*P. hypolateritia*) and Rosellinia disease (*R. arcuata*).

"Briefly, the treatment of parasitic root diseases in tea is directed toward the eradication of the fungus from the soil by the destruction of roots which

bear the fungus, and by the removal as far as possible of the material on which the fungus may feed, in order to starve any remaining free in the soil. In addition, steps are taken to prevent the further progress of any of the fungus which may have escaped death by fire or starvation by separating the infected from the healthy areas by means of trenches or bare zones. Trenches, where possible, are preferable."

ECONOMIC ZOOLOGY—ENTOMOLOGY

The ecology of the American grey squirrel (Sciurus carolinensis Gmelin) in the British Isles, A. D. Middleton (*Zool. Soc. London, Proc., 1930, III, pp. 809–843, pls. 6, figs. 4*).—Following an introduction and description of the American gray squirrel, the study is reported upon under the headings of introduction into the British Isles, spread and distribution, habitats, habits, breeding, food and damage, enemies and parasites, seasonal activity, fluctuations and disease, economic importance and control measures, the reduction in the numbers of the red squirrel, disease among red squirrels, fluctuations in the red squirrel population, and the interrelations of red and gray squirrels. A list of 26 references to the literature is included. See also the account by Theobald previously noted (E. S. R., 58, p. 450).

The food habits of the ring-necked pheasant in central Nebraska, M. H. Swenk (*Nebraska Sta. Research Bul. 50 (1930), pp. 33, figs. 4*).—Following a general account of the introduction of the pheasant into America, Nebraska, and other Missouri Valley States, its life history and habits in Nebraska, etc., the food habits of pheasants in other States are reviewed. This is followed by a summary of the year's food based on the crop contents of 100 Nebraska pheasants and a discussion of the percentages of various foods in the 100 pheasant crops. The study is based upon the crop and gizzard contents of 50 male and 50 female pheasants, taken in varied habitats, 8 each month, except in May and June, when 10 were taken.

The findings, the details of which are presented, show the pheasant's capacity for good or harm to be quite great. It is pointed out that its economic status is essentially a local matter, dependent on local conditions. Though predominantly a granivorous bird, a large portion of the grain eaten is probably waste grain. If not permitted to build up too large a population in any locality or on any farm, the good done in destroying noxious insects probably will, on the whole, about balance the damage done to crops.

American waterfowl: Their present situation and the outlook for their future, J. C. Phillips and F. C. Lincoln (*Boston: Houghton Mifflin Co., 1930, pp. XV+312, pls. 13*).—Part 1 of this work deals with our waterfowl and their habitats (pp. 3–65), part 2 with adverse factors (pp. 67–220), part 3 with conservation (pp. 223–256), and part 4 with sport and sportsmen (pp. 257–282). The appendix deals with the North American game waterfowl—their common names and ranges, with some notes on their present status and their body weights (pp. 283–300).

Observations on some Wyoming birds, A. B. Fuller and B. P. Bole, Jr. (*Cleveland Mus. Nat. Hist. Sci. Pubs., 1 (1930), No. 2, pp. 37–80, pls. 10*).—The authors record observations made of the bird life during the course of several separate trips to Wyoming.

The birds of Matto Grosso, Brazil: A report on the birds secured by the Roosevelt-Rondon Expedition, E. M. B. Naumburg (*Bul. Amer. Mus. Nat. Hist., 60 (1930), Art. 1, pp. VII+432, pls. [18], figs. [47]*).—In addition to the distributional list of species and subspecies of Matto Grosso, Brazil, which takes up the greater part of the work (pp. 55–403), the author deals with the geo-

graphic position, topography, physiography, and climate of the State, the interrelations of campo and Amazonian faunas, and the distributional analysis of bird life and endemic species and subspecies; gives a list (1) of the endemic species and subspecies of Matto Grosso, (2) of families and the number of endemic species and subspecies by which each is represented in Matto Grosso, (3) of distinctly North American birds wintering in Brazil and of birds common to North and South America and breeding in Brazil, and (4) of birds in the Roosevelt Collection from Paraguay only; discusses the scope of the data presented; presents an ornithological bibliography of Matto Grosso; etc.

Animal and plant symbiosis, P. BUCHNER (*Tier und Pflanze in Symbiose. Berlin: Borntraeger Bros., 1930, 2. ed., rev. and enl., pp. XX+900, figs. 336*).—An introduction (pp. 1–18) is followed by discussions of the symbiosis of animals (1) with algae and Cyanophyceae (pp. 19–199) and (2) with fungi and bacteria (pp. 200–753), and a general account (pp. 754–832). A bibliography of 47 pages is included.

Problems and methods of research in protozoölogy, edited by R. HEGNER and J. ANDREWS (*New York: Macmillan Co., 1930, pp. IX+532, figs. 32*).—This work, to which there are 27 contributors, is presented in 42 chapters. The extended bibliography consists of books on protozoology (in whole or in part) (pp. 475, 476), journals that contain contributions on protozoa (pp. 476, 477), and references to original literature (pp. 477–519).

[Report of work in entomology at the Arkansas Station] (*Arkansas Sta. Bul. 257 (1930), pp. 52–57, figs. 3*).—Observations of the birds of Arkansas, reported upon by W. J. Baerg, were continued, a list of 21 forms being added to Howell's list (E. S. R., 26, p. 58). Brief reports follow of the progress of work with the eastern tent caterpillar, by Baerg; the control of the boll weevil in winter, by D. Isely; the southern grape rootworm (*Fidia longipes*), a report of which by Isely has been noted (E. S. R., 63, p. 463); the rice weevil, reported upon by H. H. Schwardt, against which common borax applied as a fine powder to seed corn was found effective in preventing damage; and horseflies, a summary of which work by Schwardt and Hall has been noted (E. S. R., 63, p. 753).

Control work in Crawford County by Isely with the boll weevil in winter consisted in the destruction of the places in which it might hibernate and the plowing in winter of all cultivated fields. The results of such work on a block of about 600 acres operated by 12 different farmers in the Arkansas River bottoms resulted in no injury in 1930, although heavily infested the preceding year.

Annual report of the department of entomology, R. W. HARNED (*Mississippi Sta. Rpt. 1929, pp. 13–16*).—Pecan insect investigations in 1928–29 showed that from larvae of the pecan weevil placed in cages in the fall of 1926, 8 adults emerged between July 10 and September 7, 1928, and 23 dead adults were found from time to time in the cages. These findings indicate a 2-year cycle for the species, although the fact that live larvae were found in one cage as late as July 10, 1928, would suggest a possible 3-year cycle also. Six adults of the flat-headed apple tree borer were obtained in 1928 from cages started in 1927, indicating a complete life cycle of this insect in slightly less than 1 year. An infestation of 12.3 per cent was found in nuts collected in the fall of 1928. Work commenced with the pecan bud moth (*Proteopteryx bolliana* Sling.) shows the larva to pass five or six instars. A 14 per cent parasitism of the larvae was observed. The hickory shoot borer (*Conotrachelus aratus* Germ.) was recorded for the first time in the State.

In reporting upon cotton aphid investigations in 1928–29, it is stated that infestation developed so late in the season that only the top crop was affected. Defoliation started about September 1 and continued until practically all the

leaves were off the plants. There was considerable indication that the continued use of nicotine dust is deleterious to cotton production. Four plats given 13 applications of nicotine dust showed an average loss of 41 lbs. per acre for the crop. An average of 22,906 more bolls were required to produce a 1,500-lb. bale of seed cotton on the plat with boll weevil but no aphid control than on those where both the boll weevil and aphid were controlled.

The prairie crawfish is reported by R. N. Lobdell to have been very successfully controlled on a 10-acre plat on a plantation at Okolona.

[Work with economic insects at the New York State Station] (*New York State Sta. Rpt. 1930, pp. 15–19, 40, 61–71*).—Brief accounts of the occurrence of and work of the year with insect pests under the headings of apple insects, including the rosy apple aphid, fruit tree leaf roller, eye-spotted bud moth, leafhoppers, and the cranberry rootworm (*Rhabdopterus picipes* Ol) attacking orchards; pear insects, including the pear psylla and pear midge; canning crop insects; studies on the fruit insects in the Hudson Valley, particularly the pear midge, apple maggot, and pear psylla; studies on ornamental insect problems, including the spruce gall aphid (*Adelges abietis*) and spruce mite (*Paratetranychus ununguis*); studies on the oriental fruit moth; the apple maggot; codling moth; European corn borer with respect to sweet corn in New York; Mexican bean beetle investigations; studies on cauliflower insects, including the cabbage maggot, the green peach aphid, and the onion thrips; studies on potato insects, including the Colorado potato beetle; and studies on cucurbit insects.

Insect enemies of the eye-spotted bud moth were found to be on the increase, particularly the hymenopterous parasites *Ancistrocerus tigris* Sauss. and *A. catskillensis* Sauss. Apple leafhoppers were abundant in the orchard, *Typhlocyba pomaria*, *Empoasca fabae*, and *E. maligna* being found in the greatest numbers. *Idiocerus provancheri*, the saddled leafhopper, *Gypona octolineata*, and one species of the genus Erythroneura were less abundant. The cranberry rootworm, primarily a pest of cranberry, attacked over 70 per cent of the apple crop in some instances, disfiguring the fruits with a characteristic feeding scar.

The internal parasite of psylla nymphs (*Psylledontus insidosus* Cwfd.) was found quite numerous in one orchard, and a study of its life history was commenced.

Several new colonies of the larval parasite *Macrocentrus ancylivora* of the oriental fruit moth were established in Niagara County in 1929. Twig collections made during the year showed it to be spreading rapidly and to be parasitizing the larvae in the twigs. Several hundred thousand individuals of the egg parasite *Trichogramma minutum* were also liberated, and they parasitized over 35 per cent of the eggs of the oriental fruit moth in the orchards receiving the liberations.

The green peach aphid, which in England and Ireland often occurs on sprouts of unplanted potatoes, has been observed by the station twice during the past three years on sprouts of potato tubers in grocery stores, it being the first record of such habit in this country.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 882–887*).—The brief contributions here presented are as follows: Argentine Ant in Maryland, by E. N. Cory (p. 882); Clover Weevils Become Injurious to Beans, by C. R. Crosby and W. E. Blauvelt (p. 882); Silkworms and Their Parasites in New Caledonia, by T. D. A. Cockerell (p. 882); A Note on Two Hymenopterous Parasites of *Diatraea saccharalis* Fab., by H. A. Jaynes (p. 882); *Dicymolomia julianis* Walk. Predatory upon Bagworm

Eggs, by D. McCreary (p. 883); Nicotine in Paint for Woolly Aphis Control, by L. Childs (p. 883); Two Leafhoppers of Apple and Prune in Southern Idaho and Eastern Oregon [*Empoasca maligna* (Walsh) and *Typhlocyba pomaria* (McA.)], by R. W. Haegele (p. 884); The Efficiency of the Air-Blast Type of Sprayer for Applying Insecticides, by O. I. Snapp and J. R. Thomson (pp. 884, 885); *Dichomeris piperatus* Walsingham, a Pest of Alfalfa in Puerto Rico, by F. Sein, jr. (pp. 885, 886); and Evaluation of Trichogramma Liberations, by S. E. Flanders (pp. 886, 887).

[Economic insects and their control in Kansas] (*Kans. State Hort. Soc. Bien. Rpt., 40 (1928–29), pp. 31–45, 113–118, 137–155*).—The contributions relating to economic insects and their control in Kansas presented include: Results of the 1928 Experiments in the Arkansas Valley on Codling Moth Control, by P. M. Gilmer (pp. 31–37); The Codling-Moth Situation, by A. J. Ackerman (pp. 38–41); Spraying for Codling Moth, by P. M. Gilmer (pp. 41–45); The Honeybee and the Fruit Grower, by R. L. Parker (pp. 113–118); and Insects Injurious to Small Fruits, by G. A. Dean (pp. 137–155).

Report of insect pests in Ceylon during 1929 (*Ceylon Dept. Agr., Tech. Rpts. 1929, pp. 25*).—A report of the entomological division of the Ceylon Department of Agriculture on the occurrence of and work with the insects of importance in 1929 (E. S. R., 63, p. 253) is presented by F. P. Jepson (pp. 1–18), particular attention having been given to termites affecting plants of economic importance as well as buildings and building materials. This report is followed by reports of the plant pest inspectors, by N. K. Jardine (pp. 19–21), W. R. C. Paul (pp. 22, 23), and C. N. E. J. de Mel (pp. 23–25).

Annual report of the entomological section for the year 1929, E. Hargreaves (*Sierra Leone Agr. Dept. Ann. Rpt. 1929, pp. 16–18*).—A brief report of the occurrence of and work with the important insects of the year in Sierra Leone (E. S. R., 62, p. 542).

Insect pests of sweet potato and of cassava in Jamaica, W. H. Edwards (*Jamaica Dept. Agr., Ent. Bul. 5 (1930), pp. [2]+12, pl. 1*).—A brief practical account is given of the important insect enemies of the sweetpotato and cassava in Jamaica.

An effective system of sugar cane insect control, W. D. Pierce (*North Negros Sugar Co. Buls., 1929, Nos. 1, pp. 18; 2, pp. 44, figs. 14; 1930, Nos. 3, pp. 58, figs. 40; 4, pp. 24, pls. 3; 5, pp. 23, figs. 13; 6, pp. 19, pls. 3*).—The first bulletin of this series treats of the subject in general; No. 2 is entitled A Key to the Maladies of Sugar Cane in North Negros; No. 3, The Dead Heart Borers, Part I; No. 4, The Borers of Sugar Cane in North Negros, Part II; No. 5, Root Injuries to Sugar Cane; and No. 6, The Sucking Insects and Leaf Destroyers of Sugar Cane.

Insects from Lactuca stems, E. L. Shaw (*Jour. N. Y. Ent. Soc., 38 (1930), No. 4, pp. 463–468*).—Notes are presented on the insects occurring in the stalks of *L. spicata*, particularly in the vicinity of Ithaca, N. Y.

[Insect enemies of the olive in northern Africa] (*In 9. Congrès International d'Oléiculture, Tunis, Sousse, Sfax (Tunisie), 1928. Tunis: Dir. Gén. Agr., Com. et Colon., 1929, vol. 2, pp. 274–307, 310–338, figs. 50*).—The contributions presented at the Ninth International Congress on Oleiculture, held at Tunis, Sousse, and Sfax from October 26 to November 8, 1928, include a discussion of the Insects of the Olive, particularly in the Tunis Protectorate, by Pagliano (pp. 274–307); Enemies of the Olive in Algeria, by Delassus, Brichet, Lepigre, and Balakowsky (pp. 310–335); and Control Work with the Olive Fruit Fly (*Dacus oleae*) in Morocco, by Bey-Rozet (pp. 335–338).

The pecan Phylloxera and a few other pecan insects, C. E. SANBORN (*Natl. Pecan Assoc. Proc., 28 (1929), pp. 29–33*).—This is a practical contribution from the Oklahoma Experiment Station, presented at the annual meeting of the National Pecan Association held at Ardmore, Okla., in September, 1929.

Which insects are the important enemies of shade, park, and ornamental trees in the Pacific States? H. E. BURKE (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 783–785*).—A list is given of the 50 most important insect enemies of trees used for ornament, shade, and park purposes in the Pacific States. These are ranked in importance according to information furnished in response to questionnaires sent to interested officials.

The use of the ethylene oxide-carbon dioxide mixture for treating stored grain, E. A. BACK, R. T. COTTON, H. D. YOUNG, and J. H. COX (*U. S. Dept. Agr., Bur. Ent. [1930], pp. 10, figs. 7*).—This is a mimeographed report of work which led to the development of a method of using ethylene oxide in combination with carbon dioxide for the fumigation of grain in elevator bins. The method described has been found to be admirably adapted to fumigation in elevator bins, since there is no fire hazard when the fumigant is applied in the manner described and the method of application is simple. In addition, the fumigant has no harmful effects upon the milling and baking qualities of the grain, leaves no odor, is not expensive, can be handled without danger to the operator, and when properly applied is 100 per cent effective against the grain weevil even at winter temperatures.

The use of "dry ice" as a source of carbon dioxide has proved to be the most satisfactory. Of the many fumigations conducted with the dry ice and ethylene oxide 10 to 1 mixture at the rate of 3 lbs. of ethylene oxide or 33 lbs. of the mixture per 1,000 bu. of grain, all but two cases have shown a 100 per cent kill, both in the planted test lots of insects and in the composite samples. Of the two exceptions one showed a 98.7 per cent kill and the other a 98.1 per cent kill. Two "bran bugs" (flour beetles) were found alive in one trap, and a few weevils were alive in another bag placed directly on the gate of the bin.

The details of the fumigations are given, including the method of application and observations on commercial fumigations of grain in elevator bins located at Jersey City, N. J., Norfolk and Newport News, Va., and New York City and Buffalo, N. Y. The details of 11 fumigations are followed by an account of milling and baking tests. It is pointed out that, in brief, the process consists of mixing together ethylene oxide and dry ice in large pails and introducing the mixture into the grain as it is being run into the bin, the mixture being carried down with the grain and well distributed through it. No odor of the chemicals used was left in any of the samples tested. When wheat in bulk was treated in this way, germination was found to have been little affected.

Insect pests of upholstered furniture, E. A. BACK and R. T. COTTON (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 833–837*).—This is a practical summary of information.

Some beneficial insects (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 20 (1930), pp. V+14, pls. 2*).—A practical account with colored plates illustrating many predatory and parasitic insects.

Preliminary host-list of the entomophagous insects in New Zealand, E. S. GOURLAY (*New Zeal. Dept. Sci. and Indus. Research Bul. 22 (1930), pp. 13*).—A preliminary host list, with their distribution. A list of 56 references to the literature is included.

Utilization of microbes in the control of the gipsy moth and other insect pests [trans. title], S. METALNIKOV (*Compt. Rend. Soc. Biol. [Paris], 105 (1930), No. 32, pp. 535–537*).—In earlier work conducted by the author in association

with Chorine it was found that the caterpillar of the gipsy moth is very readily infected by *Bacterium thuringiensis* and other microbes isolated from the European corn borer and other Lepidoptera. Experiments briefly reported were made during the year with the three organisms isolated from diseased European corn borer and Mediterranean flour moth found most virulent, namely, *B. cazaubon*, *B. pyrenei*, and *B. thuringiensis*. Thus far, the caterpillars of all Lepidoptera infected with cultures of these organisms, including the European corn borer, gipsy moth, cabbage butterfly, *Aporia crataegi*, satin moth, Mediterranean flour moth, and *Vanessa urticae*, have died shortly after feeding on leaves sprayed with emulsions, or dusted with spores, of these organisms.

The relative value as contact insecticides of some constituents of Derris, W. M. Davidson (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 877–879*).—"Aqueous suspensions of the four principal constituents of Derris root, i. e., rotenone, deguelin, tephrosin, and toxicarol, were sprayed upon aphids, thrips, white fly larvae, and red spider mites living on potted plants in a greenhouse. Their relative contact insecticidal value was in the order given, with rotenone the most potent. With reference to *Aphis rumicis*, they stood in the approximate ratio of 400:40:10:1. Rotenone and deguelin are both more toxic than nicotine to *A. rumicis*."

Neonicotine and certain other derivatives of the dipyridyls as insecticides, C. R. Smith, C. H. Richardson, and H. H. Shepard (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 863–867, figs. 4*).—Of 25 dipyridyl derivatives and related compounds not previously reported, neonicotine was the most toxic as a contact insecticide. It was found to compare favorably with nicotine, to which it is chemically similar.

Petroleum insecticides, C. W. Woodworth (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 848–851*).—The author presents a classification of the chief petroleum insecticides and their effect on plants.

Rotenone as a contact insecticide, W. M. Davidson (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 868–874*).—This is a report of tests made of several different types of insects with rotenone in an aqueous suspension and in dust form, the carrier being diatomaceous earth intimately mixed with precipitated rotenone.

"The aqueous suspensions were highly toxic to aphids, thrips, white fly larvae, leafhoppers, larvae of beetles, tent caterpillars, and culicine mosquitoes. Adult beetles required a much higher concentration. Poor results were obtained against squash bugs, red spiders, and mealy bugs. This might have been remedied by the addition of a penetrating and sticking agent, as there is good evidence that the active ingredients of Derris are toxic to these insects under optimum conditions of application. The dusts were effective against chicken lice, roaches, and cabbage worms, but results against soft bodied sucking insects were not so good."

[Control work with the migratory locust and nun moth] (*Trudy Nauch. Issledov. Lab. Otravl. Veshch.* (*Rpts. Work Lab. Study Poison Subst., Plant Protect. Dept. People's Commis. Agr., R. S. F. S. R.*), *No. 3 (1928), pp. 5–13, figs. 3, pp. 15–22, 23–40, fig. 1, pp. 41–50, 59–66, 67–76, figs. 5, pp. 89–94, figs. 7, pp. 99–108; Eng. abs., pp. 109–112*).—The contributions relating particularly to work with airplane application of insecticides include the following: The Avio-chemical Expedition for the Control of the Migratory Locust in Daghestan in 1926, by B. A. Pukhov (Puchov) (pp. 5–13, 109); Report of the Experimental Work of the Avio-chemical Expedition of 1926, by I. A. Parfent'ev (Parfentjev) (pp. 15–22, 109); Technical Results of the Avio-chemical Expedition in Daghestan in 1926, by G. I. Korotkikh (Korotkich) (pp. 23–40, 110); The Study of

the Toxicity of Different Arsenic Preparations for the Locust, by N. S. Vyshelesskaiā (Vyshelessky) and I. A. Parfent'ev (pp. 41–50, 110, 111); The Definition of the Width and the Character of the Dust Wave when Using Avio Method, by N. S. Vyshelesskaiā, P. N. Galakhov (Galachov), I. I. Zarring, and I. A. Parfent'ev (pp. 59–66, 111); On the Width of the Wave of Insecticides Obtained by the Avio-chemical Method (pp. 67–76, 111, 112) and The Adult Locust and the Avio-chemical Method in Its Control (pp. 89–94, 112), both by G. I. Korotkikh; and The Report of the Work of the Technical Section of the Avio-chemical Expedition for the Control of the Nun Moth in the Itshalkovsky Forestry of the Government of Nizhni-Novgorod in 1926, by IA. M. Mikhailov-Senkevich (J. Michailov-Senkevitsh) (pp. 99–108, 112).

Investigations into the locust plague in Cyprus, C. G. Pelachias (*Cyprus Dept. Agr. Bul. 1 (1929), pp. 21+[1]*).—Following a brief history of the occurrence of grasshoppers, an account is given of the species of Cyprus locusts, their life histories and habits, natural and artificial control, etc.

The thrips factor in onion sterility, H. M. Pearson (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 829–831*).—The author's observations in California show that the onion thrips may be an important factor in producing onion sterility through seriously damaging the essential organs of the blossoms.

Biological notes on aphids affecting apples, with special reference to vitality of eggs (Aphididae, Homoptera), D. L. Moody and H. B. Mills (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 822–825*).—Studies conducted in Iowa have shown that aphid eggs are quite sensitive to humidity changes in the fall.

Notes on the introduction of the woolly apple aphid parasite, Aphelinus mali, L. Childs and D. G. Gillespie (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 790–794*).—A survey of the apple districts of the Pacific coast having indicated that the woolly apple aphid parasite *A. mali* was nonexistent, except in limited areas at Vancouver, B. C., as a result of liberations by R. C. Treherne in 1922, it was introduced from Michigan by the Hood River Substation, Oregon, in the late summer of 1928. It has successfully passed two winters in the field, and has become thoroughly established at a number of points as a result of further liberations in the summer of 1929.

Preliminary report on control of the black pecan aphid, a comparatively new destructive insect of the pecan, G. F. Moznette (*Natl. Pecan Assoc. Proc., 28 (1929), pp. 192–196, figs. 2*).—This is a report on control work with the black pecan aphid (*Myzocallis fumipennellus* Fitch), which during the past few seasons has developed into a pest of considerable economic importance, occurring in many localities in the Southern States where pecans are growing. It prefers the budded varieties, but it is found on seedling pecans and occasionally they are seriously infested. The varieties Schley, Alley, and Stuart appear to be preferred; such varieties as the Curtis, Moneymaker, and Moore do not appear to have been attacked to any extent.

In its attack a yellow area is produced at the point where every aphid feeds on the foliage, which continues to increase in size as the insect continues to feed. As the yellow area ceases to extend, it gradually turns brown, commencing at the point where the feeding started, the brown area then becoming dry and shrinking. Whenever the infestation is severe the yellow and dead areas merge, and as a result premature defoliation takes place.

In control work with the pest, delayed dormant applications of lime-sulfur, Bordeaux mixture, and oil emulsion in combination with either nicotine sulfate (40 per cent) or free nicotine (50 per cent) have not proved effective up to the time of writing. Applications of nicotine sulfate (40 per cent) made in the spring after the foliage is well out and again in the late summer have given the best results.

Observations on the "yellows" disease of beans and related plants in Haiti, R. C. SMITH and H. D. BARKER (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 842–847, pl. 1*).—In this contribution from the agricultural experiment station at Port-au-Prince, Haiti, the authors describe a disease of beans resembling a mosaic but named a "yellows" disease, of serious importance in the lowlands, that is transmitted by a new leafhopper of the genus Empoasca.

Codling moth activity in the Wenatchee Valley as shown by trap records, A. SPULER (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 803–809, pl. 1, figs. 2*).—The author reports that bait trap records taken from various sections of the Wenatchee Valley show that there is a marked similarity in moth activity in all parts regardless of temperature conditions. Such factors as soil type, cultural practices, cover crops, and exposures are of relative unimportance in determining the time when the moths become active and deposit eggs in the orchards.

Experiments in killing eggs of the codling moth on harvested fruit, E. J. NEWCOMER (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 798–802*).—This is a more extended account of experimental work with eggs of the codling moth on fruit (E. S. R., 64, p. 245).

Some factors affecting the infestation of oriental fruit moth, S. W. FROST (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 813–821, figs. 3*).—Twig growth, abundance of fruit, and broods have been found in work at the Pennsylvania Experiment Station to determine largely the nature of the infestation by the oriental fruit moth where several varieties of peach are grown together.

Results of airplane dusting in the control of cotton boll worm (Heliothis obsoleta Fab.), F. SHERMAN (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 810–813, fig. 1*).—Large scale airplane dusting operations in the Brazos River bottoms in the vicinity of College Station, Tex., in 1927 indicated that the boll weevil might be successfully controlled by the use of from 5 to 6 lbs. of calcium arsenate per acre. Observations indicated that there was more bollworm damage on the heavily dusted cotton than on the untreated areas.

The coconut moth in Fiji: *A history of its control by means of parasites*, J. D. TOTHILL, T. H. C. TAYLOR, and R. W. PAINE (*London: Imp. Bur. Ent., 1930, pp. VII+269, pls. 35, figs. 119; rev. in Science, 72 (1930), No. 1867, pp. 368, 369*).—Following a brief introduction which includes a statement of the coconut moth (*Levuana iridescens* B. B.) problem as it appeared in 1925, a historical account is given of previous work (pp. 5–7), followed by a general account of the campaign instituted in January, 1925 (pp. 8–34), an account of the Levuana moth (pp. 35–177), the tachinid fly *Ptychomyia remota* Ald. (pp. 179–209), allied zygaenids and some notes on their natural control (pp. 210–229), an account of the zygaenid parasite Chalcid B (pp. 230–243), *Trichogrammatoidea nana* Zehnt., the egg parasite of Javan Zygaenidae (pp. 244–248), and the predacious beetle *Callimerus arcufer* Chapin (pp. 249–261). An annotated list of the more important literature on *L. iridescens* published in Fiji is included (pp. 263–265).

The coconut moth increased in numbers from 1877, when first recorded, until 1924, in which year its defoliation threatened the copra industry, second in importance only to sugar in Fiji. In the course of control work by the authors commenced in January, 1925, the tachinid parasite *P. remota* was introduced on August 3, 1925, from the Federated Malay States, where it normally parasitized the closely allied moth *Artona catoxantha*, known since 1892 as a sporadic pest of coconuts in Indo-Malaya. The introduced tachinid was found to attack readily the third, fourth, and fifth stage larvae of the coconut moth, and the first colony was liberated in October, 1925. Within six

months of the initial introduction of this tachinid it had spread throughout that part of the islands affected by the coconut moth, many of the outbreaks had subsided entirely, and at the time of writing in January, 1929, it completely controlled the pest and there had been no new outbreak for three years. It is recorded that within three months of liberation the parasitism on two trees became so high that *L. iridescens* was exterminated..

The review is by L. O. Howard.

The coconut leaf-miner infestation of Lagnna, Batangas, and Tayabas, V. C. ALDABA (*Philippine Jour. Agr., 1 (1930), No. 2. pp. 145–164, pl. 1, fig. 1*).—This is a report of studies of *Promecotheca cumingii* Baly, a leaf miner always present in coconut groves in the Philippines, where it attacks a few leaflets of isolated trees. In the present leaf miner infestation of Laguna, Batangas, and Tayabas, in which about 7,000,000 coconut trees are affected, the attack is most severe on those plantings around dwelling places, along the sides of roads, banks of rivers, and streams, on the borders of lakes and rice paddies, on hillsides, and in isolated groves.

On the pear-bark miner, Acrocercops astaurota Meyrick, I. C. HARUKAWA and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch., 4 (1930), No. 4–5, pp. 475–494, pls. 3*).—This is a report of studies of the life cycle and habits of *A. astaurota* commenced in 1927.. This miner, which is fairly widely distributed in the pear growing localities of Japan, produced two generations a year in the vicinity of Kurashiki. The larvae of the first generation injure the pear tree from the beginning of July to the middle of August, and those of the second generation begin to feed about September 10. The second generation overwinters as partly grown larvae and transforms to adults after the twentieth of the following June.

The important food plants thus far observed are the pear, Japanese pear, apple, and plum. While the injury is due to its ill effect on the condition of the tree in general, young trees of certain varieties of the Japanese pear may be killed when the attack is severe.

The brown cutworm (Euxoa radians Guen.), Part IV, G. A. CURRIE (*Queensland Agr. Jour., 34 (1930), No. 5, pp. 488–495, fig. 1*).—This continuation of the account previously noted (E. S. R., 64, p. 247) deals with control measures.

Contribution to a study of the Diptera of Morocco [trans. title], E. SÉGUY (*Mém. Soc. Sci. Nat. Maroc, No. 24 (1930), pp. 206, figs. 115*).—This contribution, which notes 471 species of Diptera, includes tables for the separation of genera and species, descriptions of new species, and a bibliography of 49 references.

A study of the food of mosquito larvae (Culicidae), E. H. HINMAN (*Amer. Jour. Hyg., 12 (1930), No. 1, pp. 238–270*).—The intestinal examination of over 600 mosquito larvae of 17 different species from a great variety of habitats revealed the fact that larvae ingest any material small enough to be taken in through the mouth. A list of 73 references to the literature is included.

An introduction to malariology, M. F. BOYD (*Cambridge: Harvard Univ. Press, 1930, pp. XIV+437, pls. 5, figs. 77*).—Chapter 4 of this work deals with the natural history of anophelines (pp. 205–344), chapter 5 with anopheline surveys (pp. 345–417), and chapter 6 with the relation of surveys to control work (pp. 418–426).

Oviposition of Haematopota pluvialis Linné., A. E. CAMERON (*Nature [London], 126 (1930), No. 3181, pp. 601, 602, fig. 1*).—An account of observations on the oviposition of this tabanid.

Experiments with insecticides against cattle grubs, Hypoderma spp., F. C. BISHOPP, E. W. LAAKE, R. W. WELLS, and H. S. PETERS (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 852–863*).—Ground Derris root and carriers containing Derris extracts were tested by the authors under varying conditions with excellent results. Tobacco powders and dusts containing free nicotine and nicotine sulfate were also extensively used and gave a high degree of control.

Field populations and natural control of Lucilia sericata, F. G. HOLDAWAY (*Nature [London], 126 (1930), No. 3182, pp. 648, 649, fig. 1*).—A brief account of a study of the biological agencies which play a part in regulating the numbers of the sheep blowfly (*L. sericata* Meig.).

A menace to the fruit industry: " Bug-tree " harbours fruit-fly, L. R. RIPLEY and G. A. HEPBURN (*Farming in So. Africa, 5 (1930), No. 55, p. 343, fig. 1*).—*Solanum auriculatum*, a South American plant, was accidentally imported into Natal, where it has spread into most parts of the Province. In the inland portions of Natal, the "bug-tree" apparently bears the only fruit of any significance that enables the fly to survive the winter.

Studies on the seed-corn maggot, Hylemyia cilicrura Rondani, in Japan.—I, On the seasonal life-cycle and habits of the seed-corn maggot, C. HARUKAWA and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch., 4 (1930), No. 3, pp. 371–382, pl. 1, figs. 2*).—This first contribution deals with the seasonal life cycle and habits of the dipteran most commonly found attacking seeds in Japan, recently identified as the seed-corn maggot. While its distribution on the island has not been ascertained, the species is said to be fairly well distributed.

***The fauna of British India, including Ceylon and Burma.—Coleoptera:* Staphylinidae, Vol. I,** M. CAMERON (*London: Taylor & Francis, 1930, pp. XVII+471, pls. 4, figs. 134*).—The author deals with 514 forms of staphylinid beetles, many of which are new. Descriptions of several new species are included in addenda.

***The fauna of British India, including Ceylon and Burma.—Coleoptera:* Carabidae, Vol. I, Carabinae,** H. E. ANDREWES (*London: Taylor & Francis, 1929, pp. XVIII+431, pls. 10, figs. 62*).—A total of 241 forms, including numerous new species, are dealt with.

Bronze beetle research: Report for the two years ending November, 1929, A. M. LYSAGHT (*New Zeal. Dept. Sci. and Indus. Research Bul. 25 (1930), pp. 32, pls. 22*).—This is a report of studies of the bronze beetle (*Eucolaspis brunnea* (Fab.) Sharp.), the first part (pp. 7–19) dealing with its anatomy and the second part (pp. 20–28) with its life history, habits, and means of control.

Drought-affected and injured trees attractive to bark beetles, R. A. ST. GEORGE (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 825–828*).—Hickory and pine trees dying from bark beetle attack in several localities were found to be affected by a lack of precipitation or to be near trees that had been injured by such agencies as wind and lightning and have become attractive to the beetles.

Injury to sugarcane by a small weevil, J. W. INGRAM and T. E. HOLLOWAY (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 832, 833*).—A newly discovered damage to sugarcane consisting of the destruction of the eyes and also the killing of young plants is described as due to a weevil of the genus Anacentrus.

Bee-keeping (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 9 (1930), pp. V+55, figs. 26*).—A practical account of apiculture.

The occurrence of melezitose in honey, C. E. BURNSIDE (*Amer. Bee Jour., 69 (1929), No. [11], pp. 550–552, figs. 6*).—This discussion of the rare trisaccharide melezitose which sometimes occurs in honey made from honeydew from certain pines and other trees is presented in connection with a list

of six references to the literature. The account deals particularly with its occurrence in honey gathered near Somerset, Md., from the scrub pines, *Pinus virginiana*, in July, 1928.

Notes on the distribution and altitude range of Oregon Bremidae (Hymenoptera), H. A. Scullen (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 786–789*).—Bumblebees, of which 22 species and 15 varieties are known to occur in Oregon, range from sea level to the snow line and are common in all parts of the State except the arid uncultivated sections. Several of the species are of considerable value in the red clover districts for pollination purposes.

The life of the ant, M. Maeterlinck, trans. by B. Miall (*New York: John Day Co., 1930, pp. VII+282*).—The subject is dealt with under the headings of the secret of the formicary, founding of the community, nest, warfare, communication and orientation, pastoral ants, mushroom growers, agricultural ants, and parasites, and contains an epilogue and bibliography.

Recent developments in Trichogramma production, S. E. Flanders (*Jour. Econ. Ent., 23 (1930), No. 5, pp. 837–841, pl. 1*).—A more extended account of Trichogramma production by the author has been noted (E. S. R., 63, p. 554).

On the bionomics of the larger black-male saw-fly, Dolerus harukawai Waterston, C. Harukawa and S. Kumashiro (*Ber. Ōhara Inst. Landw. Forsch., 4 (1930), No. 4–5, pp. 495–509, pls. 2*).—This is a report on biological studies of the sawfly that is injurious to the cultivated rush in Fukuoka Prefecture and has been found in Ishikawa Prefecture, Japan.

British gall mites, H. J. Burkill (*London Nat., 1929, pp. 58–68*).—A 10-page list is given of the species of mites inducing gall formation in plants in Great Britain.

ANIMAL PRODUCTION

Handbook on the feeding and nutrition of agricultural animals, I, II, edited by E. Mangold (*Handbuch der Ernährung und des Stoffwechsels der Landwirtschaftlichen Nutztiere als Grundlagen der Fütterungslehre. Berlin: Julius Springer, 1929, vols. 1, pp. XIV+575, figs. 11; 2, pp. XI+464, figs. 146*).—This treatise, in two volumes, was designed to present the known facts on the chemistry, physiology, and biology of the feeding and metabolic changes of farm animals.

Beef production from purebred, grade, and native calves, A. T. Semple and H. E. Dvorachek (*U. S. Dept. Agr., Tech. Bul. 203 (1930), pp. 16, figs. 9*).—Concluding this cooperative study between the Arkansas Experiment Station and the U. S. D. A. Bureau of Animal Industry (E. S. R., 60, p. 854), it was found that the three crops of weanling calves were produced more economically from the native than from the purebred and grade cows, due to the smaller size and hence lower winter feed cost of the grade and native cows. On the basis of an 84 per cent calf crop, the average annual cost per calf was $34.61, $31.61, $27.68, and $28.66 per head for purebred, grade, and two lots of native cows, and the average cost per 100 lbs. of gain up to weaning time was $9.67, $8.53, $7.75, and $7.93 per head in the purebred, second-cross, first-cross, and native lots, respectively. The average birth weights per calf in the respective lots were 66.9, 65.7, 61.5, and 64.2 lbs. The birth weights of the purebred and second-cross calves were uniform from year to year, but the weights of the first-cross and native calves increased as the dams increased in size.

During the fattening period after weaning there was little difference in the feed requirements per unit of gain between the grades of calves, but the purebreds ate somewhat more feed and made slightly greater gains than the

grades or natives. The average cost of 100 lbs. of gain during this period was $10.76, $11.14, $10.82, and $10.97 in the respective lots.

While the combined cost up to market weight was less for native calves, the increased selling price for purebreds and grades was more than enough to make up for the lower feed costs of the natives. The average return above feed cost was $3.06, $6.40, $7.73, and $1.24 per head in the respective lots. The average dressing percentages were 58.15, 58.85, 57.96, and 57.03, respectively. With one exception the purebreds graded highest as feeders, slaughter cattle, and as carcasses, with the second-cross calves second, first-cross calves third, and natives last.

[Experiments with swine], E. MARTIN (*Arkansas Sta. Bul. 257 (1930), pp. 44, 45*).—The studies with swine have been continued (E. S. R., 62, p. 866).

Soft pork investigations.—In this test four lots of pigs, averaging 105 lbs. each, were fed for an initial period on a ration of rice polish, tankage, and minerals. Two of the lots were fed on rye pasture and two in dry lot, and one lot of each group received a complex mineral mixture and the other a simple mineral mixture. Average daily gains of 1.5 lbs. per head were made during this period of feeding, with little difference between the dry lot and pasture groups. At the end of this period the pigs were changed to a ration of corn, tankage, and minerals. During the latter feeding period the pigs in dry lot made average daily gains of 1.36 lbs. per head and those on pasture 1.69 lbs. per head, and there was a difference of $1.18 in the cost of 100 lbs. of gain in favor of the pasture groups. There were no differences in this test that could be attributed to differences in the mineral mixtures.

Summarizing the results of feeding rice by-products, it has been found that the rice polish and rice bran produce soft pork, which requires about 8 weeks of feeding to make firm again; brewers' rice produces rapid gains and firm pork and hardens soft pork faster than corn; the rice by-products are low in proteins and minerals and for best results should be supplemented; rice polish produces satisfactory gains when fed to hogs having initial weights of 75 lbs. or more, but is unsatisfactory for pigs weighing less than 50 lbs. Rice bran is too bulky for fattening hogs.

Vitamin B for growing pigs.—A ration of brewers' rice supplemented with 12 per cent of meat meal and 3 per cent of a mineral mixture was fed to 4 lots of 3 pigs each, averaging 80 lbs. per head. In lots 3 and 4, 5 and 10 per cent, respectively, of the brewers' rice was replaced by rice polish, which is rich in vitamin B. Cod-liver oil was fed at the rate of 10 cc. daily to each pig. The average daily gains in lots 1 and 2 were 1.29 lbs. per head and they required 304 lbs. of feed per 100 lbs. of gain, while lots 3 and 4 gained at the rate of 1.16 lbs. per head daily and consumed 316 lbs. of feed per 100 lbs. of gain. In this trial there were no indications that pigs required rice polish as a source of vitamin B.

Grading up hogs by the use of purebred sires, J. C. GRIMES, W. E. SEWELL, and W. C. TAYLOR (*Alabama Sta. Bul. 234 (1930), pp. 12*).—Concluding this study (E. S. R., 64, p. 370), it was found that using purebred boars through three generations produced a marked improvement in the type and quality of pigs and in their ability to make rapid and cheap gains. As the percentage of pure breeding increased, the time required to make 200-lb. pigs decreased. Scrub pigs reached 200 lbs. in weight in 244 days, 50 per cent grades in 201 days, 75 per cent grades in 201 days, and 87.5 per cent grades in 187 days. The respective groups made average daily gains of 0.95, 1.18, 1.19, and 1.26 lbs. per head and required 465.35, 403.37, 387.63, and 381.52 lbs. of feed to produce 100 lbs. of gain.

[Poultry experiments], R. M. Smith (*Arkansas Sta. Bul. 257 (1930), pp. 45–47*).—The poultry studies previously noted (E. S. R., 62, p. 867) have been continued.

The influence of mineral supplement, cod-liver oil, alfalfa leaf meal, and sprouted oats upon production, hatchability, and fertility of the egg.—A basal laying mash of equal parts of wheat bran, wheat middlings, yellow corn meal, and ground oats and one-half part of meat scrap was used in this study, and the above supplements were added separately. The same scratch grain and liquid buttermilk were fed to all lots. The records were maintained from November 23 to September 23. The percentages of production, hatchability, and fertility in the basal lot were 47.52, 66.3, and 93.3; in the mineral supplement group 47.79, 72.5, and 93.3; in the cod-liver oil group 50.24, 69.6, and 78; in the alfalfa leaf meal group 38.93, 70.1, and 92.3; and in the sprouted oats group 46.48, 59.8, and 92.3, respectively.

The value of rice by-products in the growing ration for poultry.—At the end of the twenty-eighth week the chicks receiving the check ration in test 1 averaged 2,413.1 gm., while those receiving the rice ration averaged 2,526.5 gm. There was practically no difference in the rate of mortality in the two lots. The cockerels sold at 12 weeks of age averaged 0.2 lb. heavier in the rice group than in the check group.

The value of rice by-products for laying hens.—In this test 4 pens of 20 Barred Rock pullets each were used to determine the effect of rice by-products upon fertility and hatchability. A basal mash of 24 parts each of wheat bran, wheat shorts, and corn meal, 10 parts of dried buttermilk, 14 parts of meat scrap, 3 parts of bone meal, and 1 part of salt, together with a scratch grain composed of cracked yellow corn and wheat 2:1 was fed to pen 1. Pen 2 received the same mash as pen 1 with a scratch feed of brewers' rice. Pen 3 received a mash of 36 parts each of rice bran and corn meal, with buttermilk, meat scrap, bone meal, and salt the same as in pen 1 and brewers' rice for scratch, while pen 4 received the same ration as pen 3 except that rice polish replaced the corn meal. In the respective lots, 175, 117, 153, and 97 eggs were set; the fertility was 91.45, 91.02, 96.07, and 95.38 per cent; and the hatchability was 78.8, 69.8, 59.6, and 67.5 per cent.

[Poultry experiments], G. R. Sipe (*Mississippi Sta. Rpt. 1929, pp. 28, 29*).—Several experiments are briefly noted.

Hopper feeding grain to molting hens.—Continuing this study (E. S. R., 62, p. 163), a lot of 112 3-year-old hens fed grain free choice in hoppers laid between November and April 4,478 eggs, consumed 2,467 lbs. of grain and 412 lbs. of mash at a cost of $73.42 for feed, and returned $57.04 above feed cost. A similar lot which received a stated amount of grain daily laid 4,611 eggs, consumed 1,493 lbs. of grain and 965 lbs. of mash at a feed cost of $66.33, and returned $68.04 above feed cost. The mortality rate was 8 per cent in both lots. The average weight of 20 per cent of the birds in the hopper-fed lot at the close of the test was 3.5 lbs. and in the check lot 3.6 lbs. The hopper-fed birds consumed all the green feed on their range, while in the check lot some feed was left at the end of the test.

A study of value of charcoal for laying hens.—No outstanding differences in egg production, health, or mortality were found between lots of hens receiving no charcoal and those receiving 1 and 2 per cent and charcoal ad libitum.

To determine the possibility of deriving all of the protein from cottonseed meal for broiler production.—In this test two lots of 250 chicks each were fed for 11 weeks. At the end of this period there were 176 chicks in the lot fed cottonseed meal and 172 in the lot fed meat scrap. The cottonseed meal

chicks averaged 1.79 lbs. each and had a feed cost of approximately 19 cts., while in the meat scrap lot the chicks averaged 1.68 lbs. each and had a feed cost of 23 cts.

Comparison of the effect of a metal brooder house with a hollow tile brooder house.—In this comparison it was found difficult to provide enough heat with oil burners on extremely cold days and to prevent excessive heat on warm days in metal brooder houses. It is concluded that this type of house is not practical under Mississippi conditions.

The influence of starving and feeding mash and scratch grain, respectively, at different times on yolk absorption in chicks, B. W. Heywang and M. A. Jull (*Poultry Sci., 9 (1930), No. 5, pp. 291–295*).—In this study by the U. S. D. A. Bureau of Animal Industry, 50 groups of 30 chicks each, 24 hours old when removed from the incubator, were either starved for various intervals or fed mash or scratch grain. Three groups were given no feed and were killed 24, 48, and 72 hours, respectively, after being removed from the incubator. The other groups were fed either mash or scratch after varying intervals of starving and were killed at the end of 48, 72, 96, 120, 144, 168, 192, 216, and 240 hours.

The yolk-weight percentages of the chick weights were 16.165, 10.741, and 8.435, respectively, in the groups killed 24, 48, and 72 hours after leaving the incubator and without being fed. The chicks fed either scratch or mash for from 24 to 48 hours and then killed had about the same yolk-weight percentage as chicks starved for 48 to 72 hours. Chicks killed at 72 hours, regardless of how they were previously handled, had approximately the same yolk-weight percentage. Feeding mash or scratch grain within 48 to 72 hours as compared with starving for either of these periods did not materially affect the rate of yolk absorption. If anything, feeding tended to stimulate the assimilation of the yolk. The yolk-weight percentages were about the same in the groups killed at the same age. However, the chicks receiving mash had a higher percentage yolk weight than those receiving scratch grain. There was a fairly regular progress in the assimilation of the yolk from day to day, except for an unexplained break between the groups killed at 72 and those killed at 96 hours.

As a result of these studies it is concluded that the feeding of chicks has a slight effect on the rate of assimilation of the yolk in day-old chicks. Early feeding was not harmful, and the feeding of mash as compared with scratch grains appeared to produce a less rapid assimilation of the yolk.

The effect on growth of various protein levels of dry skim milk in a chick mash, J. L. St. John, J. S. Carver, J. P. Helphrey, W. Miller, and L. W. Cassel (*Poultry Sci., 9 (1930), No. 5, pp. 320–333, figs. 2*).—Continuing this study at the Washington Experiment Station (E. S. R., 63, p. 264), 6 lots of 33 chicks each were fed an all-mash basal ration of yellow corn meal, ground wheat, wheat bran, alfalfa leaves and blossoms, oyster shell, bone meal, and salt. To this basal ration dry skim milk was added in the following ratios: Lot 1, 92:8; lot 2, 88:12; lot 3, 84:16; lot 4, 80:20; and lot 5, 76:24, while the sixth lot received the basal ration only. The chicks were weighed weekly for the 12 weeks of the experiment.

Uniform growth was obtained with the rations containing dry skim milk, and the mortality records were practically the same in all lots. With all rations there was a decreased efficiency in the utilization of feed accompanying the increased consumption with age. Dry skim milk, however, increased the efficiency of the ration with the addition of milk up to 20 per cent of the ration. At this level the ration is about 7 per cent more efficient than at the 8 per cent milk level. The efficiency of the protein at the different levels for

promoting growth was practically the same, as was also the retention of protein by the chicks. Greater growth was obtained by increasing the protein level for the first 12 weeks, at a greater cost per unit of grain as the level increased.

The calcium-phosphorus ratio in the nutrition of growing chicks, E. B. HART, H. T. SCOTT, O. L. KLINE, and J. G. HALPIN (*Poultry Sci., 9 (1930), No. 5, pp. 296–306*).—Continuing this study at the Wisconsin Experiment Station (E. S. R., 63, p. 64), it was found that the optimum calcium-phosphorus ratio for chicks for both growth and calcification lies between 1:0.5 and 1:0.25. This ratio applied when vitamin D was present and when the ration contained from 0.61 to 1.13 per cent of calcium and 0.3 per cent of phosphorus. When a minimum amount of vitamin D was present a calcium-phosphorus ratio of 1:0.26 to 1:0.3 produced the best calcification and growth, the basal ration containing from 2.49 to 2.71 per cent of calcium and from 0.66 to 0.83 per cent of phosphorus. With a limited supply of vitamin D the optimum ratio is more limited, and the levels of calcium and phosphorus have to be higher in order to secure the same growth and calcification as when there is a generous supply of vitamin D. Attempts to adjust the ratio and the level of calcium and phosphorus in these studies with rations low in vitamin D to secure the same growth and calcification as when vitamin D is generously supplied have not been successful.

The alleged new vitamin in milk for poultry, E. B. HART, S. W. F. KLETZIEN, H. T. SCOTT, and J. G. HALPIN (*Poultry Sci., 9 (1930), No. 5, pp. 308–312, figs. 2*).—In studies at the Wisconsin Experiment Station, three series of lots were fed a basal ration of yellow corn, wheat middlings, pearl grit, raw bone, and salt, 80:20:5:5:1, and skim milk ad libitum. In some groups the pearl grit or raw bone was omitted. One series of chicks was out of doors in sunlight, the second series was kept indoors and irradiated for 10 minutes daily with a quartz mercury lamp, and the third series was kept indoors and received no addition of vitamin D.

During the course of the study conditions were observed among the chicks similar to those described by L. C. Norris and his associates (E. R. S., 63, p. 863). The birds consumed from 250 to 300 lbs. of liquid skim milk per 111 lbs. of grain ration, and the condition was also observed among White Leghorns kept indoors, handled daily, and receiving a ration containing 25 per cent of skim milk powder. That the birds were not suffering from rickets was shown by the excellent calcification of the tibias in the presence of vitiman D. "Rough handling," dropping the birds 30 in. to a concrete floor, did not produce this pathological condition.

On the basis of the results of these studies, it was found impossible to accept the conclusion of Norris et al. that milk contained some unknown factor, vitamin in nature.

Irradiated ergosterol as an antirachitic for chicks, F. E. MUSSEHL and C. W. ACKERSON (*Poultry Sci., 9 (1930), No. 5, pp. 334–338, figs. 2*).—At the Nebraska Experiment Station, 8 lots of 35 chicks each were fed for 8 weeks a basal ration known to be complete except for the antirachitic factor. Lot 1 received a supplement of 2 per cent of cod-liver oil; lots 2, 3, 4, 5, and 6 received irradiated ergosterol in amounts theoretically equivalent to 2, 4, 6, 20, and 50 per cent of cod-liver oil, respectively; while lots 7 and 8 received irradiated yeast in amounts theoretically equivalent to 10 and 30 per cent of cod-liver oil.

The chicks receiving the cod-liver oil made excellent growth, and there was no evidence of rickets in this lot. Growth was subnormal and indications of rickets appeared in the lots receiving the varying amounts of irradiated ergosterol. The lots receiving irradiated yeast did not make normal growth.

Variation in activity and production of spermatozoa by White Leghorn males, R. PENQUITE, W. A. CRAFT, and R. B. THOMPSON (*Poultry Sci., 9 (1930), No. 4, pp. 247–256, figs. 2*).—This report is based on a study of 140 samples of semen collected at the Oklahoma Experiment Station during the fall of 1925 and the springs of 1926 and 1927 from 21 Single Comb White Leghorn males hatched in the spring of 1925. The samples were collected early in the morning when the males were placed with the flock after having been confined overnight in adjacent stud pens. The samples were diluted 1 : 100 in a salt solution. Observations were made within 30 minutes after the samples were collected and at half-hour intervals thereafter until all the sperm in each sample were dead.

The samples collected in the fall of 1925 were preliminary, but nevertheless interesting in that the mean percentage of sperm alive, the mean number of sperm per cubic millimeter, and the variation in both percentage alive and number was less than for the following spring. Comparison of the two spring collections showed that during the second breeding season the males were less active, produced a slightly lower percentage of sperm alive and a decidedly smaller mean number of sperm, and showed a greater variability in number of sperm produced than during the first season. The results further substantiate the suggestion previously noted (E. S. R., 56, p. 167) that the males which were more active sexually produced a larger percentage of weak and dead sperm.

When infertile hens were mated to six of the males during the summer of 1927 they required 2 or more days before fertile eggs were laid, and no bird laid fertile eggs for more than 14 days. On this basis it would be necessary for males to mate with the same female every 2 or 3 days in order to maintain high fertility in a flock. The males were found to be more active sexually during the first 2 hours after being turned with the hens, but continued mating at intervals of less than 5 minutes to 7 hours.

Effects of winter solar irradiation of cod liver oil on production and fertility of eggs, C. SHEARD and G. M. HIGGINS (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 5, pp. 467–474, figs. 2*).—In this study 3 lots of 6 hens and 1 cockerel each were placed in November in similar compartments of a house and fed a standard all-mash ration for a period of 14 weeks. Lot 1 had 2 per cent of cod-liver oil added to the diet and was confined behind ordinary window glass, lot 2 was confined behind quartz-containing glass (Vitaglass), and lot 3 behind ordinary window glass. In January all eggs from each group were incubated at weekly intervals.

The glass used in lot 2 permitted the transmission of enough ultra-violet light during the winter to keep production and fertility of eggs at a high level. The ordinary window glass screened out the beneficial irradiations. These results appear to be due either to the transmission of solar energy in the region of from 290 to 320$\mu\mu$ or to the greater transmission of ultra-violet light, 320 to 400$\mu\mu$, by the quartz-containing glass.

Adding 2 per cent of cod-liver oil produced results equal to or slightly superior to those obtained in lot 2. This study shows that the presence or absence of the antirachitic factor vitally affects the production, fertility, and hatchability of eggs.

The effect of yeast feeding on some blood constituents of hens, A. A. HORVATH (*Amer. Jour. Physiol., 87 (1928), No. 1, pp. 208–220*).—In studies with 6- to 9-months-old Barred Plymouth Rock hens, the author found that both yeast and taka-diastase were capable of decomposing nucleic acid and liberating uric acid. Active yeast fed to hens caused an increase of the plasma inorganic phosphorus and uric acid, while feeding inactive (heated) yeast produced a

lowering of the plasma inorganic phosphorus and a comparatively smaller rise in uric acid. Adding taka-diastase to inactive yeast made it similar to active yeast in so far as it affected the plasma inorganic phosphorus, uric acid, and protein fraction. The effect of a diet rich in nucleins on the inorganic phosphorus of the blood plasma may depend upon the presence of foreign nucleases in the intestines.

A discussion is also presented concerning the effect on blood composition of the addition of phosphates and carbohydrates to an active yeast ration.

Studies in blood composition of animals under pathological conditions.—III, Feeding hens with corn smut (Ustilago zeae), A. A. HORVATH (*Poultry Sci., 9 (1930), No. 5, pp. 313–319*).—In this study the author fed 5 Barred Plymouth Rock hens for 108 days on a ration consisting of 900 gm. of dry mash and 40 gm. of corn smut. The mixture was fed moistened, and in addition grit and oyster shell were fed ad libitum. A similar lot of hens received the same moistened mash without the smut. Blood was drawn from the wing veins of all birds for 2 days previous to the start of the experiment and analyzed for uric acid, and at the end of the experiment blood from the jugular vein was tested for 9 constituents.

In the amounts and for the period fed, corn smut was not injurious to hens and did not affect the chemical composition of the blood or their egg-laying ability. The eggs from the hens fed corn smut contained on the average the same percentage of uric acid as normal eggs and were not injurious as food. The percentage of free uric acid in the yolk of hen's eggs remains very constant from the period of its growth in the ovary until inclosed in the shell. During egg production the blood uric acid drops. To a certain extent this decrease may be used as a symptom of egg yolk formation in the ovary.

The non-linear relationship of egg weight and annual production, D. R. MARBLE (*Poultry Sci., 9 (1930), No. 4, pp. 257–265, fig. 1*).—The data used in this study at the New York Cornell Experiment Station are based on the records of groups of high line and low line pullets and hens of the Cornell strain of Single Comb White Leghorns and small groups of Barred Plymouth Rocks and Rhode Island Reds. The birds were sorted into two groups according to mean body weight, and the annual egg record used was the trap-nest record for a 365-day laying year. The eggs of each bird were weighed during 1 week of each 4-week period.

The results showed a significantly skewed correlation between egg weight and annual egg production and a significant nonlinear regression of egg weight to annual egg production. The tendency to reduce egg size with both extremes of egg production caused the regression line to be nonlinear. The smaller egg size which accompanied low egg production was probably due to the lack of a general factor for vigor affecting both characters, while in the case of high production the reduction in size of egg was probably due to increased length of cycle. Both the high and low line birds exhibited this nonlinearity, as did also hens in their second laying year. Maximum egg size in any group was obtained from birds laying approximately the mean number of eggs for the group. The nonlinearity was not as significant with the Barred Rocks and Rhode Island Reds as with the White Leghorns, and body weight may have been an influencing factor in these cases.

These results indicate that for measuring the relationship between egg weight and annual production the use of the correlation ratio is more desirable than the use of the coefficient of correlation. The mean egg weight and annual production were significantly correlated when measured from the means of the arrays.

New Jersey egg-laying contests, 1929–30, J. W. Goodman (*New Jersey Stas. Hints to Poultrymen, 19 (1930), No. 2, pp. 4*).—A report of the results of the fourteenth year of the Vineland egg-laying contest, the second year of the Passaic County contest, and the first year of the Hunterdon County contest (E. S. R., 62, p. 663).

DAIRY FARMING—DAIRYING

[Experiments in dairying at the Arkansas Station] (*Arkansas Sta. Bul. 257 (1930), pp. 49–52, figs. 2*).—Three studies are noted.

Churn contamination and methods of control, M. S. Libbert.—The purpose of this experiment was to determine the organisms that are commonly found in churns, to study their habits of growth and their resistance in pure cultures to various disinfectants, and also to determine where the organisms live. Representative flora from three churns have included 57 organisms, of which 9 were molds, 1 a Fusarium, and 47 yeasts. Pure cultures of all these organisms have been grown on a medium composed of ground fir wood and plain agar without any other nutrient material, but would not grow on plain agar.

The influence of rice polish on the physical and chemical properties of butterfat, H. E. Dvorachek and M. S. Libbert.—In this study two Holstein and two Jersey cows were fed in dry lot on a basal ration of white corn chops, dried molasses beet pulp, alfalfa hay, and corn silage, with 1 per cent of salt and 2 per cent of steamed bone meal. In addition the rations contained 20 per cent of cottonseed meal and 10, 20, 30, and 40 per cent of rice polish, respectively. The cows were divided so that one of each breed composed a lot, and cream samples were taken from each animal before placing on experiment. Group 1 was started on the 10 per cent rice polish ration, and at the end of successive 6-weeks periods was changed to 20, 30, and 40 per cent of rice polish. Group 2 started with 40 per cent of rice polish and went successively to 30, 20, and 10 per cent of rice polish. Cream samples were taken at the end of each period.

The samples of cream were churned, the fat melted and placed in separatory funnels which were revolved in a centrifuge to remove most of the water and curd, and the remainder was removed by filtering. A definite increase in the liquid portion of the fat and a decrease in the solid portions directly proportional to the amount of rice polish fed was noted in this test. This change in liquid and solid portions did not appear to be associated with any particular fat constant, although the iodine absorption number closely paralleled it. Individuality, period of lactation, breed, and the use of contra fats were considered factors for overcoming the effect of rice polish.

The action of Penicillium roqueforti on butter, C. C. Walts.—Freshly separated cream was divided into two lots, one of which was heavily inoculated with a growing milk culture of *P. roqueforti*, and the other was used as a check. Both lots were churned, washed twice with sterile water, and divided into three 20-oz. portions. One portion was worked without salting, a second contained 2.1 per cent of salt, and the third 3.38 per cent of salt. Each portion was divided into five parts and stored in sterile jars at from 32 to 104° F. for 85 days.

The butters made from the inoculated cream all had a moldy flavor and odor similar to Roquefort cheese. It was evident that *P. roqueforti* was able to grow on butter under favorable moisture, salt, and oxygen conditions, but the growth occurred only on the outside surface and in the cracks and seams. The growth was also influenced by the percentage of moisture and salt.

[Experiments with dairy cattle], J. S. Moore (*Mississippi Sta. Rpt. 1929, pp. 12, 13*).—The results of two studies are noted.

Weight of calves at birth and comparison of birth weights to weights of dam.—The average birth weight of 131 Jersey male calves (E. S. R., 62, p. 164) was 51.6 lbs. as compared with 49 lbs. for 151 Jersey female calves. These weights represented 5.74 and 5.42 per cent, respectively, of the dam's weight before calving and 6.35 and 5.95 per cent after calving. The average length of gestation was 279.9 days for the male calves and 279.3 days for the female calves. The average birth weight of 44 Ayrshire male calves was 70.5 lbs. and of 38 female calves 67.4 lbs., representing 6.64 and 6.42 per cent of the dam's weight before calving and 7.48 and 7.15 per cent, respectively, after calving. The average length of gestation was 281.5 days for the male calves and 281.1 days for the female calves.

Green crops—yield and composition.—A sample of soybeans in full bloom contained 12.36 per cent of ash, while mature soybeans that had lost many of the leaves had only 4.32 per cent of ash. Spring vetch and bur clover contained over 30 per cent of protein when just beginning to bloom, and the former had 6.96 per cent of ash while the latter contained 12.25 per cent. Hop clover contained about 7 per cent of ash and 20.81 per cent of protein.

Value of legume hays for dairy heifers during lactation, H. E. Dvorachek (*Arkansas Sta. Bul. 257 (1930), pp. 47, 48*).—Continuing this study (E. S. R., 62, p. 869), the heifers were continued through 10 additional periods on the same hay ration. Lot 1 received alfalfa hay with a grain ration of equal parts of white corn chops and rice meal and 1 per cent of salt; lot 2, prairie hay with 40 per cent of white corn chops, 40 per cent of rice meal, 20 per cent of linseed oil meal, and either 3 per cent of a commercial mineral mixture or 2 per cent of steamed bone meal and 1 per cent of salt; and lot 3, the same as lot 2 with 2 per cent of cod-liver oil added to the grain.

Fairly normal lactation occurred in the alfalfa hay lot, while the heifers receiving prairie hay were unable to produce milk and maintain body weight normally. Changing from prairie hay to alfalfa hay during the lactation period had a very beneficial effect, but adding limited amounts of alfalfa meal to prairie hay had little effect during late lactation. Green grass had a marked beneficial effect on the pairie hay lots, even as late as the sixth or seventh month of lactation. The plane of nutrition was not responsible for the difference, but lack of appetite influenced the results obtained in the prairie hay lots.

The results of this study indicate that prairie hay properly supplemented will produce growth equal to that produced by alfalfa hay. During lactation, however, the heifers grown on prairie hay are unable to compete with heifers grown on alfalfa hay. This deficiency may be due to a lack of mineral reserve which can not be corrected by the addition of steamed bone meal together with cod-liver oil.

Optimum amount of silage in the dairy ration for most economical production, A. D. Pratt and G. C. White (*Jour. Dairy Sci., 13 (1930), No. 4, pp. 291–307, fig. 1*).—Continuing this study at the Connecticut Storrs Experiment Station (E. S. R., 63, p. 167), it was found that heavy silage feeding caused a slightly greater dry matter consumption and a slightly greater milk production. The group fed a light silage ration produced somewhat more milk per unit of dry matter eaten, lost more in body weight, and showed a somewhat higher income over feed cost.

Cut the cost of feeding cows, E. B. Hart and G. C. Humphrey (*Wisconsin Sta. Bul. 417 (1930), pp. 20, figs. 2*).—The present known facts concerning the feeding of dairy cattle are summarized in this bulletin, together with suggestions for obtaining sustained production at a low cost by the use of feeds grown entirely on the farm. The value of alfalfa hay is indicated.

Studies on the chemical composition of bovine blood, A. K. ANDERSON, H. E. GAYLEY, and A. D. PRATT (*Jour. Dairy Sci., 13 (1930), No. 4, pp. 336–348*).—The results of the analysis of 59 samples of blood from dairy cows and calves at the Pennsylvania Experiment Station for hemoglobin, nonprotein nitrogen, urea nitrogen, uric acid, creatine, creatinine, sugar, chlorides, phosphorus, calcium, and carbon dioxide binding capacity are given in tabular form.

Testing the producer's milk for quality, C. K. JOHNS and A. G. LOCHHEAD (*Canada Dept. Agr. Bul. 123, n. ser. (1929), pp. 16, pl. 1, figs. 2*).—The important features in connection with milk quality and quality testing are presented in this bulletin.

Thlaspi arvense (French weed) in relation to dairy products, C. H. ECKLES, W. B. COMBS, and P. DERBY (*Jour. Dairy Sci., 13 (1930), No. 4, pp. 308–318*).—To determine the effect of French weed (*T. arvense*), also known as pennycress or stinkweed, upon dairy products, the Minnesota Experiment Station mixed the ground French weed seed with the regular grain mixture fed the station herd.

The ingestion by a milking cow of French weed seed in amounts between 90 and 150 gm. or of the green forage in amounts of 500 gm. or more produced a characteristic taint in the milk. The odor was more pronounced in the cream than in the milk and most pronounced in the butter, which indicated that the volatile products unite chiefly with the fats. The most pronounced taint was obtained when the interval between feeding the seed and milking was 3 hours, less pronounced after 5 hours, and entirely gone after 12 hours. The commonly used methods of removing feed tastes from milk were only partially successful with French weed taint. This taint could be detected in butter from mixed cream when only 15 per cent of the cream was tainted.

French weed seed could be detected in mixed feeds containing as low as 0.5 per cent of the seed by adding enough water at 50° C. to moisten the entire mass. The typical French weed odor was noticeable in a few minutes, the strength of the odor varying with the amount of seed present.

Certified milk conferences held in 1930: Annual conference American Association of Medical Milk Commissions, Inc., and Certified Milk Producers' Association of America, Inc. . . . (*Amer. Assoc. Med. Milk Comns. [etc.] Proc., 24 (1930), pp. VIII+354, pls. 6, figs. 9*).—This is a compilation of the proceedings of the twenty-fourth annual conference of the American Association of Medical Milk Commissions, held at Detroit, Mich., June 23 and 24, 1930, also the proceedings of the annual conference of the Metropolitan Certified Milk Producers, held in New York February 3, 1930 (E. S. R., 63, p. 368). Both meetings were held in conjunction with the meetings of the Certified Milk Producers' Association of America.

A case of sandiness in processed cheese, H. H. SOMMER (*Jour. Dairy Sci., 13 (1930), No. 4, pp. 288–290, fig. 1*).—In this article from the Wisconsin Experiment Station the author describes two cases of "sandiness" in processed cheese, due to the presence of calcium tartrate crystals of macroscopic size.

Grades and methods of analysis of dry skim milk, E. C. THOMPSON, W. S. SLEMMONS, and R. S. FLEMING (*Jour. Dairy Sci., 13 (1930), No. 4, pp. 319–335, figs. 2*).—In this article the authors describe the three grades of quality which are applied to each of the methods of manufacture—spray, vacuum drum, and roller—of dried skim milk. The methods of analyzing dried skim milk are also described, and the important steps in carrying out the analyses are discussed.

Significance of colon-aerogenes group in ice cream.—I, Survival of members of the Escherichia-Aerobacter group to pasteurizing temperatures in ice cream, F. W. Fabian and E. W. Coulter (*Jour. Dairy Sci., 13 (1930), No. 4, pp. 273–287*).—To determine the ability of certain organisms to survive varying pasteurizing temperatures, the Michigan Experiment Station studied 7 cultures of *Aerobacter aerogenes* and 33 cultures of *Escherichia coli* isolated from varying sources and 4 lactose-fermenting organisms. Liquid cultures of the organisms were added to 10 cc. of sterile ice cream mix at the rate of 0.1 cc., which contained from 10,000 to 50,000 bacteria. The inoculated tubes were incubated for 2 hours at 37° C., and then heated in water baths for 30 minutes at temperatures of 60, 62.8, 65.6, or 68.3°. At the end of the heating period 0.1 cc. of the mix was seeded into a lactose broth fermentation tube and incubated for 48 hours at 37°; after which growth was recorded.

Of the 4 determinations made at 60°, 51.2, 39, 30, and 57 per cent, respectively, of the organisms survived. At 62.8°, 22.7, 6.8, 2.2, and 22.7 per cent survived; at 65.5°, 0, 2.4, 2.4, and 9.1 per cent survived; and at 68.3°, none of the organisms survived. These data indicate that the critical temperature for this group of organisms is about 65.5°.

The protective action of ice cream was shown by the fact that at 60° 22 of the 44 cultures failed to survive in skim milk, while only 11 cultures failed to survive in ice cream. When heated to 62.8° all of the cultures failed to survive in skim milk, while in every case certain cultures survived in ice cream. Thermal death point determinations of the organisms in cream, sucrose, milk powder, and gelatin failed to show any protective action by these ingredients of ice cream.

The ability of certain strains of these organisms to survive temperatures of 62.8 and 65.5° should be taken into consideration in using the colon test as an index of pasteurizing efficiency. These results also showed the desirability of using a pasterizing temperature of 65.5° for reducing the number of organisms rather than the more commonly used temperature of 62.8°.

VETERINARY MEDICINE

Germicidal efficiency of soaps and of mixtures of soaps with sodium hydroxide or with phenols, J. M. Schaffer and F. W. Tilley (*Jour. Agr. Research [U. S.], 41 (1930), No. 10, pp. 737–747*).—This is a report of investigations conducted in continuation of that on the germicidal efficiency of coconut-oil and linseed-oil soaps and of their mixtures with cresol, previously noted (E. S. R., 54, p. 393). Following a brief account of materials and methods, the bacteriological work is reported upon, the details being given in large part in tabular form.

"Bacteriological tests were made with coconut-oil soap, linseed-oil soap, and castor-oil soap, and mixtures of these with sodium hydroxide or with phenols, against *Eberthella typhi*, *Staphylococcus aureus*, hemolytic streptococci, *Salmonella pullorum*, *Pasteurella avicida*, *P. suiseptica*, and *Salmonella gallinarum*. Some tests were also made with sodium laurate and sodium oleate. Neutral coconut-oil soap in a concentration of 10 per cent was effective against all the test organisms except *Staphylococcus aureus*. A 20 per cent solution failed to kill *S. aureus* in one hour, while on the other hand *P. avicida*, *P. suiseptica*, and some strains of hemolytic streptococci were killed by concentrations varying from 1–1,000 to 1–6,000 within 15 minutes in the absence of organic matter. In the presence of 50 per cent skim milk a concentration of 1–100 was required. Against *P. avicida* neutral linseed-oil soap was effective in 5 per cent concentration, while neutral castor-oil soap was effective in a

concentration of 1–1,250, in both instances without organic matter. These two soaps were not tested against *P. suiseptica* but against the other test organisms they were not effective in 10 per cent concentration with 15 minutes exposure.

"The addition of sodium hydroxide to solutions of neutral coconut-oil soap made these solutions more effective against all of the test organisms except *P. avicida*, *P. suiseptica*, and some strains of hemolytic streptococci, in which cases efficiency was diminished. The presence of excess alkali decreased the efficiency of sodium laurate against *P. avicida*, while excess lauric acid increased it. Coconut-oil soap, castor-oil soap, or linseed-oil soap when mixed with various phenolic compounds in the proportion of 1 part of soap to 2 parts phenol considerably increased the germicidal efficiency of the phenols in the absence of organic matter. In the presence of milk or blood serum such increases were comparatively small. Germicidal soaps made by added cresol, commercial cresylic acid, or orthophenylphenol to coconut-oil soap were found to be efficient against *S. aureus*, even in the presence of milk or blood serum. The soap containing high-grade orthophenylphenol was odorless."

Relative toxicity of santonin and oil of chenopodium, F. R. Whipple (*Vet. Med. 25 (1930), No. 12, pp. 526–536, figs. 2*).—Experiments conducted with santonin showed that even in doses five times that needed for therapeutic action the drug is harmless and never causes any irritation of the gastrointestinal tract. Oil of chenopodium was administered with untoward results in the cases reported.

Linum neomexicanum (yellow pine flax) and one of its poisonous constituents, W. W. Eggleston, O. F. Black, and J. W. Kelly (*Jour. Agr. Research [U. S.], 41 (1930), No. 10, pp. 715–718, fig. 1*).—In this contribution the authors present a botanical description of yellow pine flax collected upon a range where cattle had been poisoned on the western slope of Sitgreaves Mountain, Tusayan National Forest, Ariz., and a brief account of an experimental study of its toxicity. An examination of samples received resulted in the isolation of a poison (probably a glucoside), following extraction in a Soxhlet apparatus, first with ether, then with alcohol, and finally with water. All three of these extracts when injected subcutaneously into mice in very dilute water solution proved fatal, and the animals exhibited the same symptoms in every case. A dried extract of the active principle, which composes 6.6 per cent of the plant, when injected into mice proved fatal in every case. The new substance, which is slow in action, has been provisionally named "linotoxin."

The pathogenic streptococci: An historical survey of their rôle in human and animal disease, D. and R. Thomson (*Ann. Pickett-Thomson Research Lab., 4 (1928), pt. 1, pp. VII+250, pls. 7, figs. 4; 4 (1929), pt. 2, pp. VIII+251–494, pls. 11*).—This historical survey of the rôle of streptococci in human and animal disease, which is in continuation of the survey of researches on the streptococci previously noted (E. S. R., 58, p. 877), consists of seven monographs relating to diseases of man.

The pathogenic streptococci: Their rôle in human and animal disease, D. and R. Thomson (*Ann. Pickett-Thomson Research Lab., 5 (1929), pp. [XII]+392, pls. 46, figs. 6*).—This consists of three monographs in continuation of the work noted above.

The incidence of avian tuberculosis in mammals other than swine, L. Van Es and H. M. Martin (*Nebraska Sta. Research Bul. 49 (1930), pp. 132*).—The details of the work conducted are presented under the headings of typing of bacillary strains (1) associated with tuberculous lesions in birds, (2) associated with generalized tuberculosis in cattle, (3) present in hemorrhagic lymph nodes of reacting bovine animals without tuberculous lesions, (4) possibly

associated with the pregnant uteri of reacting bovine animals without manifest tuberculous lesions, (5) associated with tuberculous lesions of the skin and subcutis of bovine animals, (6) present in isolated tuberculous lesions (mostly lymph nodes) of bovine animals, (7) associated with tuberculous lesions in miscellaneous mammals, (8) present in tuberculous lesions of man, and (9) associated with cases of Hodgkin's disease. A report of observations of the behavior of bacillary strains in the animals used in the typing experiments and epicritical considerations follow.

"The avian strain of *Bacillus tuberculosis* was determined to be a cause of tuberculous disease in cattle. Avian tuberculous infection of bovine animals was found only in solitary lymph node lesions in nearly 10 per cent of the cases furnishing lesions of this type. All bovine lesions originating in cases of generalized tuberculosis were shown when typed to contain the bovine bacillary strain only, and no evidence of avian infection was encountered in this class of material. Some evidence obtained indicates that infection due to the avian bacillary strain may be a factor of confusion in the interpretation of tuberculin test results. In the material supplied by 227 cases of human tuberculosis no evidence was encountered which would tend to implicate the bacillus of avian tuberculosis as a cause of tuberculous disease in man. While a certain potentiality for mischief may be attributed to the avian bacillary strain, it is not apparent that avian tuberculosis has at this time assumed importance as a menace to the public health. On the other hand, the prevalence of avian tuberculosis on farms must be looked upon as a positive hazard to other livestock."

A list of 61 references to the literature is included.

Some chemical changes accompanying the growth of bovine tubercle bacilli on Long's synthetic medium, A. G. Renfrew, K. M. Haring, and T. B. Johnson (*Amer. Rev. Tuberc., 22 (1930), No. 1, pp. 116–120, figs. 5*).—This is a report of studies in which the growth of bovine tubercle bacilli was followed analytically for a period of 16 weeks in accordance with the methods previously used at Yale University in the analytical study of human and avian tubercle bacilli and timothy grass bacilli.

Carbohydrate combinations, as judged by the copper-reducing properties of the cultures, made their appearance after the third week of growth. The analytical values for reducing sugars after hydrolysis were much higher with bovine bacilli than the determinations for avian and timothy cultures, but less than half the value determined for the human strain of tubercle bacillus employed in the laboratory.

The sensitization of cattle to tuberculin by other than tubercle bacilli, E. G. Hastings, B. A. Beach, and I. Thompson (*Amer. Rev. Tuberc., 22 (1930), No. 2, pp. 218–225*).—In work conducted at the Wisconsin Experiment Station a number of cultures were isolated from the tissues, usually lymph nodes, of cattle which had reacted to tuberculin but which had shown no evidences of the disease on post-mortem examination. These cultures, when injected into tuberculosis-free cattle, cause a sensitization to tuberculin, which condition is, in most cases, an evanescent one. The cultures were proved to be free from tubercle bacilli before use in cattle through the injection of guinea pigs, rabbits, and fowls. They produced no lesions in cattle.

It is concluded from these observations that a positive response in cattle to tuberculin is not absolute proof of infection with tubercle bacilli, since some other of the mycobacteria may invade the tissues and sensitize to tuberculin.

The blood-sugar level of the bovine, E. A. Hewitt (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 3, pp. 362–367*).—In a study conducted at the Minnesota Experiment Station the blood-sugar concentration was found to be decidedly

higher in heifers and nonlactating cows than in lactating cows. The results of the investigations indicated that "the blood sugar is higher in young cattle before their first lactation period than in nonlactating cows. There is some evidence that an extremely high blood-sugar level may be correlated with estrum in heifers. Variations in the blood sugar of a cow suffering from pyelonephritis did not seem to be specific. The blood sugar rose in a heifer suffering from sweetclover poisoning at the time of death. The sugar in the blood after death was lower than that preceding death in the case of a cow suffering from obscure paralysis."

Bovine mastitis caused by Streptococcus epidemicus, F. B. Hadley, W. D. Frost, M. Gumm, and W. E. Welsh (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 3, pp. 328–337*).—It is pointed out that up to the summer of 1925, when the work of Brown, Frost, and Shaw was conducted,[1] no cows infected with *S. epidemicus* and not associated with septic sore throat had been reported. Since that time, however, records have been made of 20 such infected cows.

While the question of acquired immunity has not been settled by the experiments here reported, it has been shown that cows may possess a decided natural immunity in some quarters yet have a marked susceptibility in others, and that one attack of the infection does not protect against subsequent attacks. The evidence presented is considered sufficient to conclude "that while the appearance of the milk can not be taken as a guide in determining whether it is contaminated with pathogenic streptococci, . . . the strip cup, leucocyte counts, bromocresol purple, and other color indicators for the determination of the pH value are valuable for this purpose, but that a bacteriologic examination of the milk is the only reliable means of diagnosis. Furthermore, it is justifiable to conclude that a very acute mastitis may be caused in cows by infection with *S. epidemicus* of human origin."

A study of Bacillus necrophorus obtained from cows, M. L. Orcutt (*Jour. Bact., 20 (1930), No. 5, pp. 343–360*).—Ten strains of *B. necrophorus* were isolated from cows either directly through cultures or by passage through a rabbit. Seven from liver abscesses, one from a spleen abscess, one from a lung, and one from an abscess in the omentum are described at length. They were found to be similar in morphology, in most cultural reactions, and in pathogenicity for rabbits, with the exception of one strain. When compared serologically by agglutination reactions certain differences were readily apparent, since immune sera prepared with four different strains allowed varying degrees of cross agglutination and apparently no cross absorption of specific agglutinins. Each immunizing strain apparently produces specific agglutinins since they are not absorbed by any other culture. As found in one culture, a strain may stimulate the production of distinct heterologous agglutinins. The fluffy type of colonies usually found by other workers was not observed in these cultures, which in all cases formed smooth, even, compact colonies in serum agar shake culture.

Udder infections and their relation to milk-borne epidemics (*New York State Sta. Rpt. 1930, pp. 36, 37*).—In a study made of an outbreak of septic sore throat its source was traced to the milk of one cow in the only herd supplying milk to the village. This cow was purchased by the station and kept under observation for several months. It was found that a septic sore throat streptococcus probably caused the epidemic, the cow presumably having been infected by the milker. The organism, which differed from *Streptococcus epidemicus* Davis usually concerned in such outbreaks, was classified as belonging to the ordinary human type *S. pyogenes* Rosenbach.

"Mad itch" of cattle, R. E. Shope (*Science, 72 (1930), No. 1874, p. 559*).—Observations made by the department of animal pathology of the Rockefeller

[1] Jour. Infect. Diseases, 38 (1926), pp. 381–388.

Institute for Medical Research of an outbreak of "mad itch" in a herd of dairy cattle in Johnson County, Iowa, in 1930 are briefly noted. The disease is a rapidly fatal one, the interval in this outbreak between the appearance of pruritus or "itch" and death ranging from 36 to 48 hours.

Experimental material was taken from the brain tissue of three cows and preserved in glycerol. That from one when subcutaneously injected into rabbits produced conditions resembling "mad itch" in cattle and produced death in 100 hours or less, but that from the other two when similarly injected produced no ill effect. The symptoms of pruritus appeared in from 70 to 80 hours after the inoculation, and death followed from 12 to 24 hours later. Guinea pigs, white rats, and mice were also found to be susceptible to inoculation. Subcutaneous injection is regularly effective in the rabbit, and intracerebral injection in the other species. Suspensions of emulsified brain of rabbits, when passed through Berkefeld filters V, N, and W, and Chamberland filter L^3, were all effective in inducing the experimental disease in rabbits.

Monthly treatment of goats with tetrachlorethylene, E. A. Tunnicliff (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 3, pp. 338–343*).—This contribution from the Texas Experiment Station reports upon the treatment of goats with tetrachlorethylene, the details of which are presented in tabular form.

The monthly treatment for as long as 14 successive months suggests that tetrachlorethylene, when repeatedly administered in therapeutic doses, is not toxic. It does not possess objectionable features which could be detected by macroscopic examination of the internal organs or by the physical appearance of the animals.

Epizoötic lymphangitis and glanders among Philippine ponies, with special reference to the occurrence of mixed infections, A. K. Gomez and Z. de Jesus (*Philippine Agr., 19 (1930), No. 5, pp. 273–281, figs. 3*).—Epizootic lymphangitis and glanders are said to be prevalent in horses in the Philippine Islands, the former being the more predominant. Four positively diagnosed cases of mixed infections of the two diseases are reported for the first time in the islands, attention being called to them as a probable and very dangerous source of infection to man.

Are chickens susceptible to contagious abortion? C. R. Strange and B. A. Beach (*Vet. Med., 26 (1931), No. 1, pp. 4–7*).—In the experimental feeding and injecting of chickens with (1) bovine abortion cultures, (2) porcine abortion cultures, (3) aborted rabbit fetuses, (4) naturally infected milk, and (5) an aborted fetal calf, no clinical evidence of the disease appeared in 32 chickens of from 5 to 6 months of age within the 3 to 4 months that they were kept under observation. The gain in weight in most instances was satisfactory. Apparently no difference resulted from the manner of administration, except that the subcutaneous and intravenous injections caused more chickens to react to the agglutination test. Bacteriological examination of the chickens at the time of slaughter failed to reveal the presence of the organism. The spleen, liver, and testis or ovary were cultured, but guinea pigs injected with this material gave negative results.

The work led to the conclusion that chickens are not ordinarily susceptible to infection under the conditions obtaining in the study reported.

The effect of the Brucella group of microorganisms on chickens, S. H. McNutt and P. Purwin (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 3, pp. 350–353*).—This is a second contribution (E. S. R., 64, p. 77).

In attempts to infect 131 chickens artificially with the several strains of Brucella, death did not result from the infection in any case nor were visible symptoms encountered. In a search for infection in farm flocks for comparative purposes, less than 2 per cent of more than 10,000 birds in 69 farm

flocks reacted to the agglutination test in dilutions of 1:25 or higher, with no flock containing more than 12 per cent of reactors. In a study made of the high-reacting birds from farm flocks it was found that they appeared healthy and soon lost agglutinins from their blood. A study of flocks containing reactors indicated little or no unthriftiness present, and none caused by Brucella infection. Chickens placed with high reactors remained healthy, and in all ways birds that were artificially fed or were injected with cultures behaved as did reacting birds from farm flocks. The longest time following injection when the organism was recovered from injected birds was 22 days. It appears that chickens on deficient diets are apt to remain reactors longer than those properly fed.

The prevalence of fowl paralysis in England, C. A. McGaughey (*Vet. Rec., 10 (1930), No. 50, pp. 1143, 1144*).—This contribution calls attention to the prevalence of fowl paralysis in England, seven separate outbreaks of the disease, apparently unconnected, having been confirmed in Lancashire and Cheshire within the last 12 months. The mortality in these outbreaks ranged from 12 birds in a flock of 60 up to 800 birds in a flock of 3,000. The losses suffered through interference with breeding and egg production were severe, one outbreak having caused the loss of £1,000 and another outbreak forced the owner to abandon poultry farming.

Chick pneumonia, B. A. Beach (*Vet. Med., 25 (1930), No. 12, pp. 546, 547*).—In bacteriological examinations of cases of so-called brooder pneumonia 355 chicks were examined, both the liver and lungs being cultured. *Salmonella pullorum* was demonstrated in 113. Fifty-three per cent of the chicks with abscessed lungs revealed *S. pullorum*, as compared with 29 per cent of those with congested lungs and 21 per cent of the normals. In the experimentally infected groups there was very little difference between the mortality of the *S. pullorum* and *Escherichia coli* infected chicks, but the mortality in the control chicks was so high that the results are not very significant.

The transmission of pullorum disease among sexually mature fowls, H. C. H. Kernkamp (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 3, pp. 280–293*).—This contribution from the Minnesota Experiment Station reports upon two experiments conducted, involving 58 and 37 grown fowls, respectively, which are considered to demonstrate conclusively that pullorum disease does spread among sexually mature fowls. Eleven of the 24 negative hens in experiment 1 and 8 of the 17 negative hens in experiment 2 (45.8 and 47 per cent, respectively) developed positive agglutination reactions after they were placed in contact with infected birds. Of the 11 hens that changed from negative to positive reactors in experiment 1, 6 (54.5 per cent) showed positive bacteriological evidence of pullorum disease at post-mortem. In experiment 2, *Salmonella pullorum* was isolated from 5 (62.5 per cent) of the hens in which positive agglutination occurred in the contact period. Approximately 24 per cent of the nonreacting and presumably noninfected birds became infected and developed the disease subsequent to association with infected fowls. This figure represents only those birds from which *S. pullorum* was isolated. On the other hand, 46.3 per cent reacted positively to the agglutination test.

Methods of detecting carriers of pullorum disease infection, W. L. Bleecker (*Arkansas Sta. Bul. 257 (1930), p. 52*).—In a comparison made of the efficiency of the simplified agglutination test described by Bunyea, Hall, and Dorset (E. S. R., 62, p. 670) with that of the tube test for the detection of carriers of pullorum disease infection, 2,159 blood samples tested by the former method were compared with the results of duplicate blood samples tested by the latter.

"The simplified method was found to have a number of advantages over the tube method: (1) It is entirely applicable to field use; (2) only one drop of blood is required; (3) testing can be done at any time during the year; (4) very little glassware is required; (5) cloudy precipitates do not interfere; and (6) it is so easily applied that repeated tests can be made, making it possible to entirely rid the flock of carriers in the least possible time."

Fowl typhoid of turkeys, W. R. HINSHAW (*Vet. Med.*, *25* (*1930*), *No. 12*, *pp. 514–517*, *figs. 2*).—This contribution from the California Experiment Station is a summary of information based upon studies by the author during the year of outbreaks of fowl typhoid in turkeys on eleven ranches in central California.

Capillariasis vesico-urethralis of silver foxes, F. VOLKMAR (*Vet. Med.*, *25* (*1930*), *No. 12*, *pp. 518–520*, *figs. 4*).—The author reports having found *Capillaria plica* at autopsy in two silver foxes raised on a ranch in Bottineau County, N. Dak.

Etiology of spontaneous pulmonary disease in the albino rat, D. T. SMITH, N. BETHUNE, and J. L. WILSON (*Jour. Bact.*, *20* (*1930*), *No. 5*, *pp. 361–370*, *figs. 7*).—It is pointed out that a number of different types of organisms are capable of producing pulmonary infections in the albino rat, namely, *Bacillus actinoides*, *B. bronchisepticus*, *B. muris*, and a streptothrix.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Arkansas Station] (*Arkansas Sta. Bul. 257* (*1930*), *pp. 14–16*, *figs. 2*).—D. G. Carter reported that pressure-treated pine and galvanized steel vineyard posts showed no deterioration after 7 years' use, painted steel posts were rusted but sound, and unseasoned, butt-treated oak posts had all failed at 6 years. Cured native oak posts with 24-hour butt treatment in hot and cold creosote bath failed 3.1 per cent at 5 years, 16.8 at 6, and 28.06 at 7, 33.3 at 8, and 42.3 per cent at 9 years. Untreated oak and pine specimens, after 4 years in the ground, showed a failure of 65 per cent of the total. In the same period 12.5 per cent of the specimens with various preservative treatments had failed, practically all of these failures occurring in the fourth year.

Studies by B. S. Clayton and Carter on rice irrigation, conducted in cooperation with the U. S. D. A. Bureau of Public Roads, showed that a total depth of from 27 to 30 in. of water including rainfall during the season will irrigate a crop of rice A rate of flow of 1 cu. ft. per second, or 450 gal. per minute, for each 80 acres irrigated is recommended. The total cost of pumping varies from $10 to $12 per acre for lifts of 100 ft. For fields of 150 acres or less electric power is usually more economical, but for fields above 160 acres the oil engine furnishes the cheaper power. Over-all paint efficiencies of from 55 to 60 per cent could be generally attained by careful tests of new wells.

Brief data are also included on factors in farmhouse planning and on farm building costs.

Terracing farm land in Georgia, O. E. HUGHES (*Ga. Agr. Col. Bul. 394* (*1930*), *pp. 22*, *figs. 13*).—Practical information is given on the laying out and construction of terraces for farm land.

Land reclamation and the farm business, H. B. ROE (*Agr. Engin.*, *11* (*1930*), *No. 11*, *pp. 368–370*, *figs. 3*).—A brief analysis of the subject is contributed from the Minnesota Experiment Station, including an outline of a program of needed research.

Clearing tight stones from farm lands, R. U. BLASINGAME, N. A. KESSLER, and H. B. JOSEPHSON (*Agr. Engin.*, *11* (*1930*), *No. 11*, *pp. 363*, *364*, *fig. 1*).—The results of an experiment in clearing an 8-acre field of stones, conducted coopera-

tively by the Pennsylvania Experiment Station, the U. S. D. A. Bureau of Public Roads, and a commercial manufacturer of explosives, are briefly presented and discussed.

The clearing method used included a combination of hooking loose, mudcapping, and snakeholing. This proved considerably cheaper than either drilling and blasting or mudcapping and snakeholing alone. The superiority of low velocity explosive for blasting and of the wagon for hauling also was demonstrated.

Present status of research in farm electrification, G. W. Kable (*Agr. Engin., 11 (1930), No. 11, pp. 365–367, figs. 5*).—In a contribution from the Committee on the Relation of Electricity to Agriculture a brief review of the status of rural electrification research is given. This is based mainly on the results of a survey of research in the subject.

World agricultural tractor trials, 1930: Official report (*Oxford: [Univ. Oxford, Inst. Research Agr. Engin.], 1930, pp. 109, figs. 34*).—The results are reported of an exacting series of tests of 33 tractors and 3 power-driven market garden cultivators conducted by the Institute for Research in Agricultural Engineering of the University of Oxford. The countries represented by the tractors were as follows: United States 12, Great Britain 8, France 5, Germany 4, Sweden 2, Hungary 1, and Ireland 1. Of the market garden cultivators two were of British and the third of Swiss origin.

The results show that in both belt and drawbar tests there is a considerable variation among the different tractors in the amount by which the maximum power delivered exceeds the rated power as stated by the entrant. The average rated drawbar output is 78 per cent of the average maximum drawbar output, and the average rated belt output is 85 per cent of the average maximum belt output.

The results with paraffin tractors indicate that while the design of tractor engines running on paraffin may have reached a high state of efficiency, it is one which is not likely to be greatly improved upon in the near future. The results so far as belt fuel consumptions and costs are concerned did not differ very much from one another. In the drawbar fuel consumption also, while one or two machines gave a rather lower figure, there was little to choose between the performances of the majority of the machines. There was an obvious tendency for the weight per unit power to decrease as the comparative rating of the tractor increased.

Of the gasoline-burning tractors, there was very little to choose between the fuel consumptions of the majority of the machines, both on belt and drawbar. While this is partly due to the fact that five of these machines are products of the same firm, yet it appears that a high standard of efficiency has been attained by designers generally. The costs of fuel per 100-h. p. hours were considerably higher than for those in the paraffin group on account of the higher price of gasoline. No very marked variations from the average weight per maximum drawbar horsepower were evident.

The fuel-oil tractors were all of the wheel type, and fell into two classes, i. e., those with semi-Diesel or hot-bulb engines and those with full-Diesel engines. There was only a small variation in fuel consumption among the full-Diesel engines. The average fuel cost per 100-h. p. hours showed a very large saving over those in both the paraffin and gasoline groups. However, the average cost of lubricating oil for the same power output was higher than for any other type. In the semi-Diesel machines there was more variation in fuel consumptions and the averages were higher than for the full-Diesel machines, but there was a distinct saving in fuel costs over both gasoline and paraffin

machines. The average consumption of lubricating oil was not so high as for the full-Diesels. In both full-Diesel and semi-Diesel machines the weights per maximum drawbar horsepower were distinctly higher than for those of the other wheel type machines.

An illustration of and specification for each machine tested is given in a final section, together with a brief extract from the results of its test.

Adapting machinery to corn borer control, R. B. GRAY (*Agr. Engin., 11 (1930), No. 11, pp. 361–363, figs. 3*).—In a contribution from the U. S. D. A. Bureau of Public Roads a brief general account is given of some of the more important progress in the development of mechanical methods for corn borer control.

Developing the electrically heated hotbed, M. W. NIXON (*Agr. Engin., 11 (1930), No. 11, pp. 357–360, figs. 2*).—In a contribution from the New York Cornell Experiment Station, data are presented on the design, construction, and operation of electrically heated hotbeds.

Studies of the operating characteristics of hotbeds, using three steps of heat flux of 37.5, 62.5, and 100 watts per square yard, showed that in order to keep the hotbeds above certain minimum temperature conditions, a certain heat flux was necessary under certain seasonal conditions. Upon comparing the actual consumption each month with the available monthly consumption, it was noted that each step was sufficient for operation during certain months in the vicinity of Ithaca.

Two hundred, 125, and 75 watts per sash were sufficient flux for December and January, November and February, and March and April, respectively. It was further observed that to keep the air within the hotbeds above 35° F. and the soil above 50°, 75, 125, and 200 watts per 3 by 6 ft. sashes were required when the outdoor temperatures were 20, 10, and 0°, respectively, between 5 and 6 a. m. There was no demand for any more underheat. The three steps available were sufficient, and in fact two steps would have been more satisfactory, when automatic operation was employed. In very cold weather the air temperature ran around 42° and the soil 55 to 60°, making a uniform difference of about 15°. The hotbed temperatures were independent of daily fluctuations in outside conditions, due, no doubt, to the insulation around and underneath the hotbeds.

Moisture condensed and froze on the underside of the sash when the outside temperature fell to about 20°. The thickness of this frost layer varied inversely as the outdoor temperature, and so regulated the heat losses through the sash that remarkably uniform soil and air temperatures were maintained in spite of rather extreme changes in outdoor temperatures.

Cooling as a factor in sanitary milk production, A. C. DAHLBERG (*Agr. Engin., 11 (1930), No. 12, pp. 409–412, fig. 1*).—In a contribution from the New York State Experiment Station, data are presented on the essentials of proper milk cooling, including the necessary equipment.

The studies showed that the cooling tank should be large enough so that when filled with cans of milk there will be twice as much ice and water as milk. Although the tank is large it is necessary for can cooling. Insulation with 3 in. of cork, or its equivalent, when protected against moisture was found to save more than its cost in refrigeration in one summer. The insulation is essential for maintaining a low temperature, although 3 in. may not be necessary.

Milk can be satisfactorily cooled by placing it immediately after the can is filled at milking time in cold water at 40° F., provided the tank is of ample size, well insulated, and a large enough source of refrigeration is available.

The milk need not be stirred or surface cooled. Should stirring be thought to be desirable, one stirring after 1 or 2 hours in the water is ample. For milk of bad flavor, such as absorbed feed flavor, aeration may be desirable.

Control of air conditions in potato storages, M. A. R. Kelley (*Agr. Engin., 11 (1930), No. 11, pp. 371–374, figs. 3*).—An analysis of the controlling factors in the design of potato storages is contributed from the U. S. D. A. Bureau of Public Roads.

A building study of 60 Missouri farms, J. C. Wooley (*Agr. Engin., 11 (1930), No. 12, pp. 407, 408, figs. 2*).—The progress results of a survey of present building practice on 60 Missouri farms are reported from the Missouri Experiment Station. No conclusions are drawn.

A study of farm roofings, M. C. Betts (*Agr. Engin., 11 (1930), No. 12, pp. 403–406, fig. 1*).—In a contribution from the U. S. D A. Bureau of Public Roads, practical information is given on different types of roofing materials, special attention being devoted to durability and fire resistance.

The W. S. C. laying house, J. S. Carver and L. J. Smith (*Wash. State Col. Ext. Bul. 160 (1930), pp. 18, figs. 10*).—This laying house is described and illustrated and practical information given on its construction.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics and sociology at the Arkansas Station, 1929–30] (*Arkansas Sta. Bul. 257 (1930), pp. 85–97, figs. 2*).—Investigations not previously noted are reported on as follows:

Farm income and standard of living, J. A. Dickey (pp. 85–87).—Further investigations during 1924–1926 in the study previously noted (E. S. R., 61, p. 580) showed that the per acre value of products sold declined from $41.27 in 1924 to $18.59 in 1926, due largely to the lower price for cotton. The average total value of products sold, expenses, and returns to the operator for his labor and management after deducting all expenses, including allowances for unpaid family labor and interest on farm property investment, were $1,161, $874, and $287, respectively, in 1924, and $788, $784, and $4, respectively, in 1926. The earnings per farm varied from a loss of $2,200 to a gain of $3,800 in 1924, and from a loss of $3,900 to a gain of $1,800 in 1926. Size of farm was the most important factor affecting the earnings. The average expenditures in 1924 for items of family living were for food $158, clothing $132, furnishings $39, health $42, and personal advancement $38. Food furnished by the farm was valued at $475. There was a tendency found for expenditures for advancement to increase with the gross earnings of the family.

Organization, management, and cost of production on rice farms, O. J. Hall (pp. 87, 88).—Further study during the year in the investigation previously noted (E. S. R., 62, p. 885) showed the following: The average amount (92 farms) remaining for farm labor and management after paying expenses, including depreciation, interest on investment, and change in inventory, was $1,982. Of the farms, 20 showed losses and 17 net returns of less than $1,000. Prices received for rice ranged on 90 farms from 75 cts. to $1 per bushel. The range for the middle 50 per cent of 105 farms included in the study was from 85 to 92 cts. Yields on the 105 farms ranged from 23.6 to 83.3 bu. per acre, averaging 51.9 bu. The range for the middle 50 per cent of the farms was from 41.8 to 61.7 bu. The total cost of production per bushel for the middle 50 per cent of 93 farms ranged from 48 to 77 cts. Costs for water varied from $4.55 to $23.26 per acre and interest charge on investments from $2.66 to $27.23 per acre, the average cost for the 25 per cent of the farms having the lowest costs being $6.46 for water and $4.94 for interest as compared with $17.32 and $16.34 for the 25 per cent with the highest costs.

"To summarize, larger net returns in rice farming, over a period of years, must be sought in increased yields and reduction of costs through increased efficiency in use of machinery and equipment, particularly in supplying water for the rice crop. Capital costs may also be reduced by a proper adjustment between land, machinery, and labor, and with the use of the most economical types of machinery."

Farm credit, B. M. Gile (pp. 88-90).—Local surveys were made in counties in the extreme northwestern part of the State and in the vicinity of Morrilton and Russellville in the upper Arkansas Valley. The percentages of farms surveyed that were mortgaged were 50 and 49, respectively, and the average mortgage debt 27 and 28 per cent of the estimated value of the land and buildings, respectively, in the two areas. Thirty-nine per cent of the owners and 33 per cent of the tenants in the northwestern counties used seasonal credit, the owners averaging $604 and the tenants $188. In the Arkansas Valley section owners used $185 and tenants about $188 of seasonal credit. Banks furnished the seasonal credit of 88 per cent of the owners and 70 per cent of the tenants in the northwestern area and 85 per cent of the owners and 54 per cent of the tenants in the Arkansas Valley section. Merchants furnished credit to 4 and 8 per cent of the owners and to 19 and 41 per cent of the tenants, respectively, in the two areas. Ten per cent or more of the short-term credit was used for the following purposes: Owners in the northwestern area, supplies and repairs 34 per cent, fertilizer 11, labor 13, and livestock 13 per cent; and tenants in the northwestern area, food and clothing 21 per cent, supplies and repairs 35, payments on old debts 15, and labor 23 per cent. Owners in the Arkansas Valley section, food and clothing 27 per cent, supplies and repairs 19, fertilizer 14, and furniture 10 per cent; and tenants in the Arkansas Valley section, food and clothing 55 per cent, supplies and repairs 10 per cent, and feed 11 per cent.

Farm taxation, C. O. Brannen (p. 90).—Taxes on 358 farms studied in 1928 averaged $79, being 11.1 per cent of the net returns before deducting taxes, and 9.9 per cent of the farm expenses. On 542 farms studied in 1929 taxes absorbed 7.4 per cent of the net farm returns, the lowest percentage for any year from 1923 to 1929.

[*Marketing of strawberries*], O. J. Hall and C. O. Brannen (pp. 90-93).—In cooperation with the Bureau of Agricultural Economics, U. S. D. A., a study was made of the market prices of strawberries in New York City from January 1 through July in the years 1926 and 1927. A chart is included showing for 1927 the prices with weekly receipts up to 450 cars. An increase from 3 to 10 cars to 50 cars per week early in the season caused a drop in price of about 40 cts. per quart. Later in the season an increase of from 200 to 300 cars caused a drop in price from about 22 cts. to 17 or 18 cts. per quart. With receipts of from 350 to 400 cars, the price was between 15 and 17 cts. per quart. Arkansas was found to be in a poor competitive position on the New York City market when North Carolina and the eastern shore States have normal or large yields. In the sales studied, joint account sales showed losses about as common as gains. F. o. b. sales showed some losses, but gains were more typical, and commission sales showed gains in all cases.

Grade and staple estimate and primary market price of cotton, C. O. Brannen (pp. 96, 97).—A sample representing about 10 per cent of the bales ginned showed that in both 1928 and 1929 about 94 per cent of the upland cotton of the State was white, middling, or better, and that 87 per cent in 1928 and 85.1 per cent in 1929 was tenderable on future contracts. In 1929 the staple of 14.8 per cent of the cotton was under ⅞ in.; 29.4 per cent, ⅞ and 29

in.; 25.7 per cent, $\frac{15}{16}$ and $\frac{31}{32}$ in.; 17.8 per cent, 1 and $1\frac{1}{32}$ in.; 8.2 per cent, $1\frac{1}{16}$ and $1\frac{3}{32}$ in.; and 4.1 per cent, $1\frac{1}{8}$ in. and longer. The chart included shows the average monthly prices per pound for each year 1915–16 to 1928–29 of middling cotton at 10 spot markets.

Part-time farming in Massachusetts, D. Rozman (*Massachusetts Sta. Bul. 266 (1930), pp. 103–146, figs. 11*).—This bulletin reports the results of a study based on a house-to-house survey made in 1929 of 820 houses in the town of Holden, taken as a representative section of the State, and 115 records taken in 1928 in the Lowell area (4 towns) and 84 records in the Taunton area, areas with 19 and 11 industrial plants, respectively. Operators who spent two or more months a year in some other work in addition to their agricultural activities were classed as part-time farmers. Retired persons on small holdings and living largely on receipts from other sources but obtaining part of their income from farming were included. Heads of families devoting only part of their working time to farming but having grown sons or employing hired men who worked on a full-time basis were not included as part-time farmers. In the Lowell and Taunton areas only industrial laborers, artisans, and farm or other manual laborers whose agricultural output amounted to at least $100 were included.

In the town of Holden 66 of the houses were occupied by bona fide (full-time) farmers and 519 by part-time farmers. Part-time farmers handled 57.8 per cent of the total acreage and 46.1 per cent of the cropped acreage and produced and sold 46.2 and 35.1 per cent, respectively, by value of the products. Of the part-time farmers 65 were retired and widows, 316 skilled and unskilled laborers and artisans, 59 office workers and salesmen, 51 business men and superintendents, and 28 professional men. Thirty-nine and nine-tenths per cent raised only crops, principally vegetables, 2.1 per cent livestock only, and 58 per cent both livestock and crops, and 203 had surpluses for sale. The value of output ranged from less than $50 for 23.9 per cent to over $1,000 for 6.4 per cent, averaging $287. Thirty-four and seven-tenths per cent farmed less than 1 acre, 77.3 per cent less than 10 acres, and only 7.5 per cent 50 acres or more. Only 14.3 per cent kept one or more cows. Of the land farmed by part-time farmers, 15.3 per cent was valued below $25 per acre, 72.2 per cent at $25 to $99, 6.2 per cent at $100 to $299, and 6.3 per cent at $300 or over, as compared with 5.5, 88, 6, and 0.5 per cent, respectively, for the full-time farmers.

No comparisons with full-time farming are made for the Lowell and Taunton areas. Of the part-time farmers, only 5.2 and 9.5 per cent, respectively, settled on their present holdings prior to 1910, as compared with 61.8 and 59.5 per cent, respectively, after 1920. In the Lowell area 78.3 per cent came originally from farms, but only 1.7 per cent had been regular farmers in the United States, and none were under 30 years of age. In the Taunton area 76.2 per cent came originally from farms, 5.9 per cent had been regular farmers, and 7.2 per cent were under 30 years of age. In the Lowell area increased earnings and cheaper living (45.3 per cent) and improved health and better housing (47 per cent) were the chief reasons for entering part-time farming. In the Taunton area these two reasons (54.7 and 16.7 per cent, respectively), independence in old age (10.7 per cent), and love of country life (13.1 per cent) were the chief reasons.

In the Lowell area the average land holding was 7 acres, 23.5 per cent of the holding being less than 1 acre, and only 12.2 per cent 15 acres or more. In the Taunton area the average holding was 9 acres, 22.6 per cent being less than 1 acre, and 28.6 per cent 15 acres or more. The value of the agricultural output on 47.8 per cent of the farms in the Lowell area was less than $300, and

it was $1,000 or over on only 7 per cent. In the Taunton area the percentages were 33.4 and 15.5, respectively. The average value of agricultural output per operator was $464 in the Lowell area, of which 67.8 per cent was from livestock products and 32.2 per cent from crops. In the Taunton area the average was $664, of which 49.5 per cent was from livestock products and 50.5 per cent from crops.

In the Lowell area the average farm income per family was $292 for regular part-time farmers (regularly devoting time left from daily work to farming) and $697 for seasonal part-time farmers (spending entire time on land during the farming season), as compared with $281 and $887, respectively, in the Taunton area. The average total annual incomes of all part-time farmers in the two areas were $1,696 and $1,827, respectively, of which 18.5 and 24.9 per cent, respectively, were farm incomes. Other phases, such as prior occupation, early training, nationality, land utilization, kinds of livestock, value of products used, returns per hour of labor, marketing methods, credit facilities, housing conditions, effects of part-time farming on the bargaining power and employment and the health and morale of operators and their families, and savings are also discussed.

The study indicated that there are at least 60,000 part-time farming enterprises in Massachusetts and that at least one-third of the agricultural production of the State comes from such enterprises; that part-time farming tends to develop either on land submarginal for agriculture or on sites important for residential purposes and that as the development is largely on the first type of land it does not enter into active competition with regular agriculture for land; that part-time farming increases tax receipts in communities with decadent agriculture, secures a certain economic stability for the wage earner and makes possible better food and housing conditions, and its development goes hand in hand with better transportation facilities, shorter hours in industry, and the location of industrial plants in small towns and rural communities; that further development will take place within the next 10 or 20 years; and that any agricultural program for the State must give increased consideration to the problems of part-time farming.

The collection of taxes by the State of New York, and the division of these revenues with units of local government, M. S. Kendrick (*New York Cornell Sta. Bul. 511 (1930), pp. 53, figs. 6*).—Of 10 laws enacted since 1896 in New York providing for the collection of taxes under a general State law and the division of the proceeds with units of local government liquor license (1896), mortgage tax (1905), motor vehicle registration (1910), franchise tax on manufacturing and mercantile corporations (1917), personal income tax (1919), billiard and pocket-billiard room license (1922), real estate brokers and salesmen license (1922), franchise tax on State banks, trust companies, and financial corporations (1926), franchise tax on national banks (1926), and tax on gasoline (1929), all except the first are still in effect. The factors accounting for the development of such legislation and the provisions of the several laws are described. The financial significance of the revenues derived under these laws and the problems of what taxes should be selected for such a system, how the revenues should be divided between the State and the local units, what local units participate in the division, the measures of apportionment that should determine the share of each local unit, and the control the State should exercise over the funds apportioned to local units are discussed. An appraisal is made of the present New York system, and recommendations are made for changes in the present system and its extension to other taxes.

Taxes collected by the State and shared with local units increased from 7 per cent of the yield of all taxes, both State and local, in 1913 to 17 per cent

in 1928. During the period the share of the State increased from 24 to 46 per cent of its total tax revenues and that of the local units from 4 to 9 per cent of all local taxes. In 1913 the local units received $10,634,837 from these taxes and the State $12,512,992. In 1928 the receipts were $69,418,576 and $92,907,380, respectively. The average general property taxes levied increased from $17.95 per $1,000 of full value of real estate in 1910 to $18.39 in 1915 and to $22.31 in 1928. The rates on other sources of taxation have been moderate and have not in most cases increased since 1915.

The following general recommendations are made regarding the present system in New York: That units of local government should receive larger revenues from State-collected sources; that in general the revenues should be granted to the larger local units, such as the county, rather than to the smaller units, such as school district, town, or village; and that the funds apportioned to the local units should be used as sanctions for the State to enforce the proper keeping of financial accounts by such units.

It is specifically recommended that apportionments be made of the receipts from the taxes studied as follows: Mortgage registration tax, that at least 95 per cent of the receipts be apportioned among local units; license taxes on real estate brokers and salesmen and on the operation of billiard and pocket-billiard rooms, that the entire amount be apportioned to local units; franchise tax on State banks, trust companies, and financial organizations, that part of the revenues, probably those from the larger financial institutions, should go to the State rather than to the local units; personal income tax, that distribution to local units be made on the basis of personal income taxes paid instead of assessed valuation; and that the motor vehicle registration revenues be apportioned on the same basis as the gasoline tax, i. e., on the basis of total mileage of highways in counties outside of cities and incorporated villages and other than State and county highways instead of on the basis of registration fees paid by counties. It is also recommended that laws be enacted providing for (1) an income tax of 4.5 per cent on unincorporated businesses to be collected by the State and shared with local units, and (2) State administration of the tax on railroad property, which is now for the most part administered locally, and an apportionment to local units on the basis of contribution to railway revenue.

The West Virginia community packing house at Inwood as a State service to apple growing, F. J. Schneiderhan (*West Virginia Sta. Bul. 238 (1930), pp. 24, figs. 11*).—The organization and operation of the demonstration community packing house established by act of the West Virginia Legislature in 1919 and operated by the College of Agriculture of West Virginia University are described. The benefits to the apple-growing industry of the State through encouraging grading, training apple inspectors, encouraging better cultural methods, etc., are discussed.

The average cost of packing at the plant has been 32 cts. per barrel, of which approximately 10 cts. consisted of overhead expenses. Eight-year packing records showed that only 58.5 per cent of the apples brought to the plant were packed in containers. It is estimated that the percentage of culls could be reduced from 41.5 to 12.5 by improved cultural practices and by control of insects and diseases.

Social, economic, and homemaking factors in farm living, R. C. Hill, E. L. Morgan, M. V. Campbell, and O. R. Johnson (*Missouri Sta. Research Bul. 148 (1930), pp. 90, fig. 1*).—This study, made by the departments of rural sociology, home economics, and agricultural economics of the station in cooperation with the U. S. D. A. Bureau of Agricultural Economics, covers the families of 34 owners, 19 owner-renters, and 17 tenants in the area previously

studied by Burt (E. S. R., 63, p. 87). It was made for the purpose of ascertaining possible correlations between social participation, farm business, and home making. It is based upon a survey made in 1928 and covers the year beginning March 1, 1927. The data concerning organized social participation, the farm business, and the use of agencies for improving farming were secured from the farm operators, and those regarding diet (noted on page 490), education, unorganized social participation, and other factors concerning the farm home from the home makers. In analyzing the data the families in the case of each factor were distributed into three approximately equal groups numerically.

Two phases of social participation are considered: (1) Social contact, using Burt's definition "a social contact is the exposure of one person to group influence for one hour"; and (2) family recreation, defined as "the participation of two or more members of a family in social activity when not in the presence of persons other than members of that family." The social contacts per person for the year varied from 150 to 1,500, averaging 691.5, of which 90.5 per cent were provided by unorganized activities. For the renters the average number of contacts and the percentage arising from unorganized activities were 779 and 93.2 per cent, for the owner-renters 761.6 and 90.6 per cent, and for the owners 612.8 and 88.5 per cent. The per person average for families in family recreation participation for the year varied from 0 to 2,910 times, averaging 1,027.4 times. The average for the different thirds of the families were 1,717.6, 943.6, and 383.6 times. Owner-renter families averaged 1,142.1, renters 1,081.5, and owners 938.

Tables are included and discussed showing for the different types of operators the acreage farmed, capital used, expenses, receipts, income from capital and operator's labor, labor income, money available for family living and saving; the relation of money available for living and saving to acreage farmed, size of family, and capitalization, of labor income to the same factors and age of operator, and of age of operator to acreage farmed; the number of farmers having automobiles, trucks, or tractors; the number of farmers exchanging work; and the extent to which use was made of different agencies for improving farming and the changes in methods resulting from such use.

Of the children from 6 to 18 years of age, 39.1 per cent were in the grades in school standard for their age (grade = age in years — 5), 37.5 per cent below standard, and 23.4 per cent above standard. An educational index was obtained for each family by rating the children on the basis of age and grade attained and adults on the basis of total schooling and dividing the total rating by the number of persons in the family. The highest one-third represented an average for children from slightly above to almost 2 years above standard and for adults from high school to 2.5 years of college attendance, and included 47.1 per cent of the owner families, 31.6 per cent of the owner-renters, and 17.6 per cent of the tenant families. The medium one-third represented an average of slightly more than 1 year below standard for children and approximately eighth grade graduation for adults and included 23.5 per cent of the owner families, 36.8 per cent of owner-renters, and 35.3 per cent of tenant families. The lowest one-third represented from 2 to 4 years below standard for children and primarily grammar school attendance for adults. From 1 to 14 newspapers and magazines were read per family, 30 per cent reading from 9 to 14, and 38.6 per cent from 6 to 8. Owner-renter families read the largest and tenant families the smallest number.

Approximately 50 per cent of the families spent from $35 to $60 per person per year for clothing and 32.9 per cent less than $35. Of the owner-renter group 42.1 per cent spent $51 or more, as compared with 26.5 per cent of the

owners and 23.5 per cent of the tenants. Of the tenant families 47.1 per cent spent from $22.50 to $34.99 per person, as compared with 26.5 and 32.9 per cent, respectively, for the other groups. Rating housing conditions on the size of house in proportion to size of family, upkeep, sanitary conditions in and surrounding the house, extent of modernization, furnishings, beauty, and the appearance of yard and surroundings, 41.2 per cent of the owner, 42.1 per cent of the owner-renter, and 5.9 per cent of the tenant families were in the highest one-third, and 20.6, 26.3, and 64.7 per cent, respectively, in the lowest one-third. The working day of home makers was from 15 to 16.5 hours (highest group) for 38.2 per cent of the owner, 52.6 per cent of the owner-renter, and 17.6 per cent of the tenant families, and from 11.5 to 13.5 hours (lowest group) for 32.4, 10.5, and 41.2 per cent, respectively.

Tables are included and discussed showing the relation of money available for saving and living to social contacts, family recreation, number of newspapers and magazines read, quality of diet, educational index, clothing expenditure, and length of working day; of social contacts to length of time in the community, age of operator, and educational index; and of length of working day to quality of diet.

The 70 families were rated on the 11 factors—social contacts, family recreation, number of newspapers and magazines read, educational index, capital invested, money available for saving and living, labor income, quality of diet, food expenditure, clothing expenditure, and the farm home or housing conditions of the family—on a basis which made the highest possible rating, 33. A superior rating (24 to 30 points) was given to 41.2 per cent of the owner, 58 per cent of the owner-renter, and 17.6 per cent of the tenant families, and a below-average rating (13 to 20 points) to 26.4, 15.9, and 41.2 per cent, respectively. The owner families tended to vary slightly as to the contribution made by the different factors and to have a high capital investment and a low labor income. Owner-renter families tended to vary more than the owner families as to contributions by the different factors and to have slightly higher contributions from family recreation and labor income and slightly lower contributions from capital invested than the owner families. Renter families tended to vary more than the other groups in the contributions from the different factors, to have large contributions from social contacts, labor income, and newspapers and magazines read, and small contributions from capital invested.

The factors studied were found to be definitely related as follows: "The greater the length of time in the community, the more numerous the social contacts. With an increase in the age of the farm operator was associated a decrease in social contacts. The larger the families, the greater the amount of family recreation. The greater the amount of money available for saving and living, the greater was the extent of family recreation. With the larger amounts of money available for saving and living, a larger number of newspapers and magazines were read. The larger the amount of money available for saving and living, the better was the quality of the diet. The larger the amount of money available for saving and living, the better the education of the family. Operators having a large acreage had a large capitalization. The larger farms were operated by the younger operators. In general those having a large capitalization had a small labor income. Those operators having a large capitalization had a large amount of money available for saving and living."

Slight relations were found as follows: "The larger the families, the greater the number of social contacts. The larger the capitalization, the greater the family recreation. The larger the amount of money available for saving

and living, the greater the number of social contacts. Families of the older group of operators consumed high quality diets. The larger the labor income, the higher the quality of diet consumed."

The following factors showed no relation: Size of family and money available for saving and living; age of operator and money available for saving and living; age of operator and labor income; size of family and labor income; clothing expenditures and money available for saving and living; social contacts and clothing expenditures; food expenditures and clothing expenditures; size of family and quality of diet; social contacts and quality of diet; social contacts and education; social contacts and newspapers and magazines read.

In the superior group of the families, education, housing conditions, capitalization, money available for saving and living, newspapers and magazines, and diet were the factors contributing more than the average, and clothing expenditures, social contacts, labor income, and food expenditures were the factors contributing less than the average. In the average group, clothing expenditures, food expenditures, diet, and education contributed more than the average, and housing conditions, capitalization, social contacts, family recreation, newspapers and magazines, and money available for saving and living contributed less than the average. In the below-average group social contacts, family recreation, labor income, and diet contributed more than the average, and education, housing conditions, clothing expenditures, food expenditures, money available for saving and living, and newspapers and magazines less than the average.

A table is included summarizing graphically the 26 factors concerning the 70 families studied.

FOODS—HUMAN NUTRITION

Preserving fruits by freezing—II, Figs, J. G. WOODROOF and J. E. BAILEY (*Georgia Sta. Bul. 164 (1930), pp. 11, pl. 1, figs. 2*).—In continuation of the series of publications noted previously (E. S. R., 64, p. 191), freezing storage of fresh figs is discussed. It is pointed out that the inability of fresh figs to stand storage and the impossibility of profitable drying of the fruit in the humid sections of the South have militated against the commercial fig industry in that section of the country.

The chief difficulty in preparing figs for freezing is the peeling which is necessary for some varieties. Hand peeling is slow and expensive and thus far no satisfactory mechanical peeler has been devised. Since peeled figs do not discolor as rapidly as do peaches, the question of containers is simplified. There seems to be no need of removing air by vacuum nor is exposure to light objectionable. Good results have been obtained with paper board, tin, aluminum, and glass containers, and aluminum foil, cellophane, and parchment wrapping materials have given good results as wrapping for the frozen product.

A 35 per cent sugar sirup was found to be the most satisfactory for covering the figs before freezing. Slow freezing at about 0° F. proved more satisfactory for figs than quick freezing at lower temperatures on account of smaller losses of juice into the sirup on defrosting and less change in the red pigment of the seed cavities. Of the different varieties tested—Celestial, Turkey Brown, Magnolia, Ischia Black, Ischia White, and Lemon—the Turkey Brown and Ischia White are recommended as the best varieties of Georgia figs for freezing.

Fruit freezing conference: Georgia Experiment Station and co-operators, compiled by J. G. WOODROOF (*Georgia Sta. Circ. 89 (1930), pp. 15*).—This summary of a fruit freezing conference held at the station October 10, 1930 (E. S. R., 63, p. 790), includes abstracts of the general discussion as follows: Report of Work at Georgia Experiment Station, by J. G. Woodroof (pp. 4-6);

Refrigeration and Frozen Fruits and Vegetables, by C. T. Baker (pp. 7, 8); Fast Freezing as a Means of Food Preservation, by R. V. Grayson (pp. 8–10); Preservation of Foods by the Quick Freezing Method, by E. G. Ballenger (pp. 10–12); Refrigeration with Carbon Dioxide Snow, by W. T. Comer (pp. 12, 13); and *Cellophane in the Frozen Fruit Industry*, by O. F. Benz (pp. 13, 14).

The percentage composition of cooked food mixtures: Cakes, M. E. Davis and B. Wait (*Jour. Amer. Dietet. Assoc., 6 (1930), No. 1, pp. 36–48*).—The authors have demonstrated with six different kinds of cake that it is possible to standardize the preparation of recipes so that the average percentage composition calculated from standard tables represents no greater error than that allowed for all foods in dietary studies and calculations. The recipes and exact procedure for each of the cakes are given, together with their composition as determined by analyses of six different cakes of each kind and by calculation from the standard composition of the various ingredients.

The Boston Cooking-School cook book, F. M. Farmer (*Boston: Little, Brown & Co., 1930, new ed., rev., pp. XII+831, pl. 1, figs. 97*).—This is the first revision since 1923 of this well-known cookbook, of which total printings of 1,436,000 copies have been made since the first edition in 1896. New material has been included in the present edition to deal with changes in methods brought about by the introduction of new equipment such as mechanical refrigeration, pressure cookers, and the like, and with methods of preparing new vegetables, fruits, and salad greens which have come into use since the preceding revision.

Diet of the farm families, R. C. Hill, E. L. Morgan, M. V. Campbell, and O. R. Johnson (*Missouri Sta. Research Bul. 148 (1930), pp. 34–48*).—This study of the food consumption and expenditures of 70 farm families in a central Missouri community is part of the investigation noted in detail on page 486.

The data for the dietary study were secured by the survey method. Information was given by the home maker in the form of an estimate, covering the year beginning March 1, 1927, of the amount and where possible the value of the food produced on the farm for home use and the amount and cost of the foods purchased from the stores. The cost of the food purchased was estimated in two ways: (1) The amount spent for each type of food during the year and (2) the weekly grocery bills for various seasons of the year. The differences between the two estimates for a family for a year varied from 0.1 to 17.3 per cent, with an average for all home makers of 5.3 per cent.

As a further means of checking the accuracy of the data, various items were compared with similar data reported in food consumption studies of farm families by Funk (E. S. R., 36, p. 289) and by E. Hawley[2] and of workingmen's families by the U. S. Department of Labor.[3] The calorie intake per adult male unit per day for the families included in the present study varied only slightly from the Missouri farm families reported by Hawley, but the averages of the entire groups as reported by Hawley and by Funk were considerably lower than in the present study. The relative consumption of various groups of foods did not differ markedly in the various studies. On the basis of these comparisons it was concluded that "the survey method for securing food consumption data may prove to be sufficiently accurate in that field of work."

In analyzing the data, the system described by Rose (E. S. R., 62, p. 90) was followed for the dietary calculations and the Hawley system (E. S. R., 58, p.

[2] Average Quantity, Cost, and Nutritive Value of Food Consumed by Farm Families (A Preliminary Report). U. S. Dept. Agr., Bur. Home Econ., 1926, pp. 29 [Mimeogr.].

[3] U. S. Dept. Labor, Bur. Statis. Bul. 357 (1924), pp. 446.

84) for reducing the members of the family to the unit basis. The standards for judging the quality of the diet were adapted to the high calorie diets of the present study from the distributions given by Rose (E. S. R., 59, p. 188). The system of rating differed from those usually followed in that it was based upon a series of penalties for undesirable deviations from the standards adopted. The penalties ranged from 0.5 for too high or too low cereal, sugar, or fat comsumption to 5 for unusually low fruit and vegetable or milk consumption.

When finally rated and penalized, the dietaries could be separated into three fairly distinct groups which were given the letters A, B, and C. Grade A diets were considered to have no deficiency, but too high a protein content, with a penalty of 2 to 2.5; grade B, frequently deficient in fruits and vegetables and occasionally in milk and frequently high in protein, with other minor variations, with a total penalty of 3.5 to 6.5; and grade C, deficient in fruits and vegetables and milk or very deficient in fruits and vegetables, high in protein, high or low in fat or sugar, and occasionally in cereal, with a total penalty of 7 to 10.5. Approximately 40 per cent of the diets were classed as grade A, 45.7 grade B, and 14.3 per cent grade C.

The diets were conspicuously high in total calories. Less than 16 per cent came within the ordinary range of 2,000 to 3,999 calories and 50 per cent were 5,000 calories or more. The high calorie diets occurred most commonly among the owner families and less frequently among the renter families. The diets were also very high in protein, which averaged 13 per cent or more of the total calories. The average distribution of total calories among the various food groups was cereals 26.2, fruits and vegetables 10.2, sweets 11.1, fats and oils 13.4, milk and cream 19.6, and eggs, meat, and cheese 19.5 per cent. The low values for fruits and vegetables pointed to inadequacy of the diets in this important group of foods.

The total expenditure for food varied from 24 to 78 cts. per adult male unit per day. The expenditure was 55 cts. or more for one-third of the families, from 43 to 54 for one-third, and less than 43 for the remainder of the families. Among the three groups there was a tendency for the owner families to spend slightly more than the owner-renter, and considerably more than the renter families. The cost, however, was not the determinant of the quality of the diets as a whole. One-fourth of the grade A diets were in the lowest cost range per 100-calorie portions, and there were practically as many grade A diets costing from 0.92 to 0.99 ct. per 100 calories as of those costing 1 to 1.18 cts.

Nutrition survey in Labrador and northern Newfoundland, H. S. Mitchell (*Jour. Amer. Dietet. Assoc., 6 (1930), No. 1, pp. 29–35*).—This is a general report of a dietary survey conducted in 12 or more villages of from 5 to 50 families each in northern Newfoundland and in southern Labrador to the extent of a total of 50 dietaries. Tabulated data are given of the food supply for one year of a family of four adults and three children 5, 3, and 2 years of age. Since most of the food supplies are purchased for the year, the items are few in number, consisting in this case of flour, hard bread, rolled oats, molasses, sugar, oleomargarine, condensed milk, salt pork, salt beef, fish, fresh game, fresh cod, berries, raisins, potatoes, navy beans, dry peas, and rice. From this food supply, the amounts of essential food constituents have been calculated in terms of total for the family for the year and for a day and per person per day, the three children being calculated as 1.5 adults. The values per person per day were protein 104, fat 43, carbohydrate 457, iron 0.019, calcium 0.42, and phosphorus 2.1 gm., with a total of 2,610 calories.

Attention is called to the disproportionate ratio of calcium to phosphorus in the diets and to the extremely low content of vitamins, particularly A and D. Night blindness, beriberi, rickets, and mild scurvy are of widespread occurrence.

An almost universal complaint of constipation was noted and attributed to the concentrated nature of the food supply.

Basal metabolism of young women, H. McKay (*Ohio Sta. Bul. 465 (1930), pp. 37, figs. 3*).—This complete report of an investigation which has been noted from time to time in progress reports (E. S. R., 63, p. 90) includes a brief review of literature on the subject, a description with photograph and diagram of the apparatus employed, a discussion of the physical condition of the subjects, and tabulated basal metabolism data, with comparisons from other similar studies. The general conclusions drawn are as follows:

"Standards for prediction of basal metabolism of young girls from 14 to 18 years should be somewhat higher than those of Benedict, which are based on his girl scout data, and somewhat lower than the Aub-DuBois standards. Age and surface area afford a better method of prediction of basal metabolism than either height or weight. For young college women the daily fluctuation in basal metabolism is noticeable. Basal metabolism of young college women tends to be somewhat higher in the spring than in the autumn or winter."

A procedure for metabolism studies, C. M. Coons (*Jour. Amer. Dietet. Assoc., 6 (1930), No. 2, pp. 111–117*).—A detailed description is given of the plan followed in making the collections of feces and urine and in sampling and preparing the food for analysis in the investigation reported by Coons and Blunt (E. S. R., 63, p. 490) on the calcium, phosphorus, and nitrogen metabolism of pregnant women living in their own homes and consuming a self-chosen diet. In the discussion special emphasis is given to the time and labor-saving advantages of the food composite plan and the convenience and possibility for greater accuracy in the use of Pyrex containers for both collections and dryings of food and feces.

The management of obesity, R. M. Wilder (*Jour. Amer. Dietet. Assoc., 6 (1930), No. 2, pp. 91–100*).—In this discussion dietary treatment is emphasized as the only safe means of reducing weight. In planning diets for the obese, the total metabolism should be considered. This is made up of the metabolism of rest, of muscular work, and of the digestion, assimilation, and utilization of foods. In obesity the basal metabolism is usually normal and any treatment which increases it, such as the use of thyroid extracts, creates an abnormality which may result in serious harm. Increasing the metabolism by muscular exertion has the disadvantages of increasing the strain on the heart, which may be weakened by the obesity, and of increasing the appetite, resulting in an extra intake of food. Practical suggestions for dietary measures for reducing include a liberal supply of protein, restriction of sweets and pastry, liberal amounts of leafy vegetables and citrus fruits, and occasional limitations in the amount of water. In discussing the use of medico-actuarial tables as criteria of optimal weight, the working rule is given of regarding the values as minimal optimal for individuals under 30 and maximal for individuals over this age.

Appetite in relation to weight, M. M. Harrington (*Jour. Amer. Dietet. Assoc., 6 (1930), No. 2, pp. 101–110*).—In order to determine the appetite response of normal individuals to various types of diet, three subjects were given for varying periods of time a normal diet furnishing 1.5 to 2 calories per gram, a bulky diet furnishing 1 calorie per gram, and a highly concentrated diet furnishing 2.5 calories per gram. All three subjects lost weight on the bulky diet and gained weight on the concentrated diet, although both were offered ad libitum. Various hospital case reports are given showing the interest in food expressed by emotional individuals and the necessity in controlling obesity of establishing the will to lose weight.

Relation of diet to the production of dental caries in young rats, G. C. Knowlton (*Soc. Expt. Biol. and Med. Proc.*, 27 (1930), No. 8, pp. 757, 758).—Unsuccessful attempts to produce dental caries in young rats by diets deficient, respectively, in vitamins A, B, and D and in minerals are reported briefly.

[Iron studies], D. Dickins (*Mississippi Sta. Rpt. 1929, pp. 16, 17*).—In this progress report it is noted that studies by O. Sheets and E. Frazier on the iron content of various vegetable tissues (E. S. R., 62, p. 111) have shown that turnip tops and mustard greens were richer in iron than were English peas, butter beans, string beans, okra, field peas, collards, lettuce, sweetpotatoes, and spinach. Young plants were richer in iron than the more mature plants and the outer leaves than the inner. The iron content of the greens of the same varieties of mustard and turnips grown at three branch stations under as similar conditions as possible was found to vary with the iron content of the soil.

Studies of the effect of various methods of cooking on the iron content of the vegetables listed above showed that steaming and cooking in the pressure cooker were the best methods from the viewpoint of iron conservation.

Effect of added iron on the haematopoietic properties of dried milk, A. L. Bacharach (*Lancet [London], 1930, II, No. 18, pp. 957, 958, fig. 1*).—In order to determine whether the incorporation of a soluble iron salt in a modified roller-dried milk during manufacture would render it superior to liquid cow's milk for hemoglobin production, an amount of the iron salt was added sufficient to raise the iron content of the dried milk, reconstituted one in eight, to 40 parts per million, or about three times the normal iron content of liquid cow's milk.

The reconstituted milk and raw milk were fed ad libitum to two comparable groups of young rats, the consumption of the two types of milk being about the same. Although the animals on the liquid milk grew slightly more than those on the reconstituted dried milk, the latter group showed an almost constant normal hemoglobin index throughout, while those on the fresh milk lost hemoglobin rapidly. The average weekly intakes per rat of iron and copper by the raw milk and dried milk groups were iron 0.5 to 0.7 and 1.7 and copper 0.13 and 0.08 mg., respectively. Since the copper content of the raw milk was higher than of the dried, it is concluded that the limiting factor for hemoglobin production in the raw milk was iron.

"It appears, therefore, that the recognized low hematopoietic properties of milk solids can be materially enhanced by drying in the milk appropriate quantities of a suitable iron salt, and that in this way a dried milk may be prepared containing sufficient iron and copper to allow normal hemoglobin formation in the young growing albino rat."

The effect of the prolonged use of exclusive meat diets on two men, W. S. McClellan (*Jour. Amer. Dietet. Assoc.*, 6 (1930), No. 3, pp. 216–228, figs. 4).—A more general discussion of the investigation noted previously from other sources (E. S. R., 64, p. 289).

Urea concentrations in the blood of the rat in relation to pregnancy and lactation on diets containing varying concentrations of protein, H. T. Parsons (*Jour. Biol. Chem.*, 88 (1930), No. 1, pp. 311–330, figs. 6).—A preliminary report of a part of this investigation has been noted previously (E. S. R., 59, p. 892), as well as the general findings summarized in a progress report (E. S. R., 63, p. 90). The present paper contains a description of the experimental procedure and the data leading to the suggestion that the marked increase in the urea content of the blood of lactating rats following nursing may result from an emotional response to the act of suckling rather than from the formation of milk in the mammary gland.

Some observations on the growth of rats on "fat-free" and fat-containing diets, R. G. SINCLAIR (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 9, pp. 1059–1062*).—Attention is called to certain observations concerning the theory of Burr and Burr (E. S. R., 63, p. 595) that linoleic acid and other highly unsaturated fatty acids are essential constituents of the diet. In the author's experience, rats kept in false-bottom cages on the same basal fat-free diet as that used by Burr and Burr invariably developed the scaly condition of the tails. When kept in ordinary stock cages and given the vitamin supplements mixed with the basal diet instead of fed separately, the animals remained in good condition. The change in manner of feeding the vitamin concentrates was definitely ruled out as a contributing factor. On the theory that the protection was due to the presence of highly unsaturated acids in the feces, a comparison was made of the iodine numbers of the phospholipid fatty acids in rats raised in stock and false bottom cages, but no differences could be detected. Moreover, the addition of cod-liver oil to the fat-free diet of rats raised in false bottom cages did not prevent the development of marked scaliness of the tail, while lard to the extent of 1 per cent of the diet was effective.

"While the evidence available at present seems to be rather against the probability that the failure of rats fed on a 'fat-free' diet to develop scaliness if they are raised in stock cages is due to the consumption with the feces of appreciable quantities of a highly unsaturated fatty acid, the final solution of the problem will come only from direct experimentation."

A note on the calcium retention on a high and low fat diet, M. G. MALLON, R. JORDAN, and M. JOHNSON (*Jour. Biol. Chem., 88 (1930), No. 1, pp. 163–167*).—Calcium balance experiments were conducted on two young women on high and low fat diets of practically the same calcium content, 0.484 and 0.485 gm., respectively. The diets consisted of raw, centrifuged milk, cornstarch, cane sugar, apples, lean beef, and salt, with 100 gm. daily of lard furnishing the fat in the high fat diet. The experiment was continued for 18 consecutive days, divided into two periods of 9 days each, one for the high fat and the other for the low fat diet. Each 9-day period consisted of a 3-day preliminary period followed by two 3-day experimental periods.

On the high fat diet the calcium balance for one subject shifted from slightly positive to negative and for the other from slightly negative to slightly positive. On the low fat diet the first subject had a negative calcium balance in both 3-day periods, although the balance was nearer equilibrium in the second period. The second subject changed from a slightly negative to a positive balance. It is concluded that fat per se can not have exercised a definite influence upon the calcium retention of the two subjects of this study.

The present status of human milk production, B. R. HOOBLER (*Jour. Amer. Dietet. Assoc., 6 (1930), No. 1, pp. 10–28*).—This is a review and discussion of the literature on factors affecting human milk production. Of the factors influencing the quantity of milk produced, the method of stripping the breasts after each nursing has been shown to be the best method for maintaining a milk supply or for increasing a failing one. Concerning the diet, there is a general unanimity of opinion that the protein content should be relatively high and that the optimum calorie intake is about 3,000. Vitamin studies, as far as can be interpreted from rat feeding experiments, appear to indicate that all the vitamins play a part in milk production, but that vitamins A, B, and E have a greater influence than C and D. The action of hormones in retarding or stimulating milk flow is thought to be important, but requiring much more study. A list of 76 references to the literature is appended.

The fat-soluble vitamins of milk, M. E. F. Crawford, J. Golding, E. O. V. Perry, and S. S. Zilva (*Biochem. Jour., 24 (1930), No. 3, pp. 682–691, figs. 7*).—A reinvestigation of the question of the solubility of vitamins A and D of milk fat in water as determined by their presence in skim milk is reported with the conclusion that "the entire vitamin A and vitamin D content of milk is associated with the milk fat. There are no indications that these vitamins are more concentrated in one fraction of the milk fat than in another, nor that there is a significant loss in either vitamin due to separating or churning, and consequently by testing the butters it is possible to obtain the approximate relative potency of milks."

In the vitamin D test the growth method of Soames and Leigh-Clare (E. S. R., 60, p. 95) was used with satisfactory results.

Vitamins in sugarcane juice and in some cane-juice products, E. M. Nelson and D. B. Jones (*Jour. Agr. Research [U. S.], 41 (1930), No. 10, pp. 749–759, figs. 7*).—These studies, reported from the Bureau of Chemistry and Soils, U. S. D. A., deal chiefly with the content of vitamin B (B and G) in sugarcane juice expressed at different pressures and in several products obtained from the juice. As preliminary tests showed that the juice contained but little A and practically no D, further studies for these vitamins were not made.

Ordinary cane sugar juice was found to contain but little vitamin B. The juice obtained from bagasse by high pressure contained about twice as much as the ordinary juice. The limiting factor of the vitamin B complex was apparently the antineuritic vitamin, since the substitution of autoclaved yeast for the high pressure juice was immediately followed by loss in weight. The juice from the upper portions of the cane stalks proved to be richer in the antineuritic vitamin than from the lower. This was attributed to the fact that the upper portion of the stalk is the seat of greater metabolic activity than the lower. Cane sirup, Louisiana and Porto Rico blackstrap molasses, and cane cream, all made from sugarcane juice, were found to contain no demonstrable quantities of vitamin B. The results with molasses are contrary to those previously reported by Nelson et al. (E. S. R., 53, p. 660) for cane molasses.

Vitamins in dried fruits.—II, The effect of drying and of sulfur dioxide upon the vitamin A content of fruits, A. F. Morgan and A. Field (*Jour. Biol. Chem., 88 (1930), No. 1, pp. 9–25*).—In continuation of the investigation noted previously (E. S. R., 62, p. 295), it is reported that the amount of destruction of vitamin A produced with comparable methods of preservation by drying with and without sulfur dioxide varies widely in peaches, prunes, and apricots. Curative tests were followed, the materials being fed for 56 days after the onset of ophthalmia. The standard unit chosen was the amount of frozen fresh fruit which produced an average weekly increase of weight of 6 to 8 gm. during the experimental period.

The fruits tested, which included Muir and Elberta peaches, prunes, and apricots were reported to have a relatively large content of vitamin A in the fresh frozen state, "that of the apricots comparing favorably with the best figures reported for spinach, egg yolk, or butter. The peaches and prunes had less vitamin A than the apricots, but as much or more than tomatoes, bananas, or lettuce."

The peaches lost little of their vitamin A as the result of any of the drying processes, from 86 to 100 per cent being retained in all cases. The prunes varied widely in the stability of their content of vitamin A. The dehydrated, sulfured prunes retained 91 per cent, the sun dried, sulfured from 60 to 62, the dehydrated, nonsulfured from 24 to 41, and the sun dried, nonsulfured from

45 to 57 per cent. Lye dipping of the prunes had no effect upon vitamin A retention.

In apricots the vitamin A was even more easily affected by drying, the amount retained varying from 16 to 51 per cent. The original content of vitamin A was so high, however, that even the least successful of the drying processes yielded a product richer in vitamin A than the best of the peach and prune products. The sulfured products again appeared to retain more vitamin A than the unsulfured, but the actual amount of sulfur dioxide in the dried prunes appeared not to be the governing factor. Differences in the amounts and kinds of oxidative catalysts present in the fruits are thought to account for the variations in the observed stability of vitamin A.

Blood findings in albino rats suffering from lack of vitamin A, R. G. Turner (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 9, pp. 1006–1010*).—Chemical analyses and hemoglobin and red blood cell count determinations are reported for adult rats on a stock diet, a vitamin A-free diet, and the latter with the addition of cod-liver oil. All the tests on the rats on the vitamin A-free diet were made after the onset of xerophthalmia. The data on composition were also compared with the previously reported data of Anderson et al. (E. S. R., 63, p. 789).

"From the results given it is concluded that the relative amounts of uric acid, nonprotein nitrogen, creatinine, urea nitrogen, chlorides, and sugar in the blood of xerophthalmic animals are not striking enough or constant enough to constitute a decided change. Further, the hemoglobin and red cell count are not sufficiently altered to show specific lesions in vitamin A deficient animals. It is believed that anemia does not result from lack of vitamin A."

Treatment of bone tuberculosis by large amounts of vitamins A and D, C. L. Pattison (*Brit. Med. Jour., No. 3630 (1930), pp. 178, 179*).—The favorable results reported by Mellanby and Green (E. S. R., 62, p. 294) in the use of vitamin A concentrates in the treatment of puerperal sepsis and their conclusion concerning the potency of this vitamin in combating bacterial infection suggested the use of vitamin A concentrates in the treatment of bone tuberculosis. Since bone calcification is thought to be controlled by vitamin D, it was also considered desirable to test at the same time a concentrated source of vitamin D. Two preparations were used, both containing large amounts of vitamin A and one in addition having a high vitamin D content. The first preparation was estimated to have about 20 times the vitamin A potency of cod-liver oil and to contain 10,000 antirachitic units per cubic centimeter (Coward). The second preparation had double the A content of the first, but only 100 antirachitic units per cubic centimeter.

The subjects were hospital patients from 3 to 15 years of age suffering from bone tuberculosis in varying stages. Of these, 43 were given one or the other of the concentrates and 35, serving as controls, 10 cc. of cod-liver oil daily. Of the patients receiving the concentrates, 15 were given an average dose of 7.8 cc. of the first preparation daily for an average period of 3.5 months and then an average dose of 9.4 cc. of the other preparation for an average period of 3.4 months. The remaining 28 were given an average dose of 9.6 cc. of the second preparation for an average period of 4.1 months.

Of the entire group receiving concentrates, 74.4 per cent were clinically improved at the end of the experimental period and 25.6 per cent showed no improvement. In the control cod-liver oil group 71.4 per cent showed clinical improvement and 28.6 per cent no improvement. The differences between the two groups were so slight as to indicate that preparations containing large amounts of vitamin A and D were of no greater curative value in this condition than cod-liver oil.

The effect of vitamin deficiencies on carbohydrate metabolism, M. E. SMITH and B. SURE (*Arkansas Sta. Bul. 257 (1930), pp. 57, 58*).—In this progress report it is noted briefly that in vitamin A deficiency (in rats) the blood sugar curve shows considerable fluctuation, with occasional hyperglycemia, that there is no disturbance in the alkaline reserve of the blood until the final stages associated with pneumonia, and that the glycogen content of the liver remains normal. In vitamin D deficiency most of the animals show hyperglycemia, but no other disturbances in carbohydrate metabolism. In vitamin G deficiency some of the animals show a high concentration of apparent sugar, attributed to nonsugar reducing substances in the blood. There is no significant reduction in the glycogen content of the liver, which was found to be the most marked change in vitamin B deficiency (E. S. R., 63, p. 693). A number of animals show marked reduction in the concentration of hemoglobin, indicating anemia.

Carbohydrate metabolism in birds.—II, Brain localisation of lactic acidosis in avitaminosis B, and its relation to the origin of symptoms, H. W. KINNERSLEY and R. A. PETERS (*Biochem. Jour., 24 (1930), No. 3, pp. 711–722*).—This paper, in continuation of the investigations noted previously (E. S. R., 63, p. 494), reports in full the experimental data indicating that the increased lactic acid found in the brains of pigeons showing symptoms of opisthotonus due to lack of vitamin B_1 is localized especially in the lower parts of the brain. The data are thought to furnish convincing proof of the theory often advanced that vitamin B_1 is associated with the intermediary metabolism of carbohydrates. It is suggested that vitamin B_1 is concerned with the oxidative removal of lactic acid, although it is admitted that definite proof of this is at present lacking.

The antiscorbutic potency of apples, M. F. BRACEWELL, E. HOYLE, and S. S. ZILVA (*Biochem. Jour., 24 (1930), No. 1, pp. 82–90*).—This is a general report to the Medical Research Council, Great Britain, of an extensive investigation of the antiscorbutic potency of apples as affected by variety, soil, age, condition of storage, and heat. The English varieties tested included Bramley Seedling and King Edward, representing cooking varieties; Worcester Pearmain and Cox Orange Pippin, dessert varieties; and Woodbine and Dabinett, cider varieties. In addition several varieties of apples from Australia, Canada, and New Zealand were tested.

Of all the varieties tested, the English cooking apple known as Bramley Seedling was found to be decidedly the most active, complete protection against scurvy being secured with 3 gm. daily. The relatively high activity of this particular apple appeared not to be related to the soil in which it was produced, the age of the tree, or the season. Apples picked before complete maturity were as active as those picked from the same tree 14 days later. Next in order of activity was the Dabinett, a cider variety, and an eating or dessert variety, Cox Orange Pippin, ranked third. Canadian dessert apples had about the same potency as the corresponding English varieties, but Australian and New Zealand apples were less potent, probably on account of increased time elapsing between picking and testing of the fruit.

Little loss in activity was demonstrated in the English-grown apples during three months' storage in air at 1° C. Storage in a mixture of carbon dioxide, nitrogen, and oxygen at 10° C. for the same period produced a slightly greater loss in activity. Apples of the Bramley variety were baked for 50 minutes in their skins without noticeable loss in antiscorbutic properties. The remarkably high content of vitamin C in the one variety of apple was not accompanied by any detectable differences in chemical composition, with the pos-

sible exception of the nitrogen content, which appeared to be higher in the variety of high vitamin C content.

The antiscurvy vitamin in apples, M. F. BRACEWELL, E. HOYLE, and S. S. ZILVA [(*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser. No. 146 (1930), pp. 45, figs. 33*).—This is the complete report of the investigation noted above.

Calcium partition in blood serum in vascular hypertension and in experimental hypervitaminosis D, S. FREEMAN and C. J. FARMER (*Soc. Expt. Biol. and Med. Proc., 27 (1930), No. 9, p. 970*).—In this preliminary report attention is called to differences in the content of diffusible calcium in the blood serum of 5 normal subjects and 16 with vascular hypertension, the average values being 65 and 57 per cent, respectively, of the total serum calcium. The average values for total serum calcium were almost identical for both groups, 10.3 mg. per 100 cc. of serum for normal and 10.5 mg. for hypertension cases.

In rabbits fed excessive amounts of vitamin D (26,000 to 61,000 rat units per day), the diffusible calcium decreased from normal values of 58 per cent to 49 per cent of the total serum calcium, while the average values for the latter increased from 14 mg. to 17 mg. per 100 cc. of serum. The inorganic phosphorus values increased to approximately twice the normal and serum proteins remained unchanged.

The toxicity of vitamin D, J. B. DUGUID (*Lancet [London], 1930, II, No. 18, pp. 983–985*).—This is a concise review of the literature on the pathological effects of excessive doses of irradiated ergosterol on animals and on human beings and on the dosage and standardization of preparations of irradiated ergosterol. A bibliography of 48 titles is appended.

Preliminary results on pathological changes in the albino rat suffering from vitamin G deficiency, H. S. THATCHER, B. SURE, and D. J. WALKER (*Arkansas Sta. Bul. 257 (1930), pp. 13, 14*).—A brief summary is given of symptoms observed by the authors in rats suffering from lack of vitamin G. It is noted that the dermatitis is not always associated with loss of body weight. Microscopic examination of the pathological changes in the skin indicated an acute inflammation, with necrosis, to the point of disappearance of the epidermis and extension of the inflammation into the muscle. Fatty metamorphosis occurred in numerous sections of the liver. No noteworthy microscopic pathological changes were noted in the tongue, kidneys, lungs, heart, thyroid gland, submaxillary gland, skeletal muscle, pancreas, aorta, trachea, or esophagus.

MISCELLANEOUS

Forty-second Annual Report [of Arkansas Station], 1930, D. T. GRAY ET AL. (*Arkansas Sta. Bul. 257 (1930), pp. 102, figs. 28*).—This contains the organization list, brief summaries of the chief lines of work of the station, and a financial statement for the fiscal year ended June 30, 1930. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Forty-second Annual Report [of Mississippi Station], 1929, J. R. RICKS ET AL. (*Mississippi Sta. Rpt. 1929, pp. 42*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1929, and departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue.

Forty-ninth Annual Report of the New York State Agricultural Experiment Station, [1930], U. P. HEDRICK (*New York State Sta. Rpt. 1930, pp. 99*).—This contains the organization list, a review of the work and publications of the station, and a financial statement for the fiscal year ended June 30, 1930. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

NOTES

Maryland University.—The seventy-fifth anniversary of the signing of the charter of the Maryland Agricultural College in 1856 was observed by the agricultural club of the university on March 6. Among the speakers were Secretary of Agriculture A. M. Hyde; Swepson Earle, whose subject was *Pioneers in Maryland Colonial Agriculture*; Dr. L. B. Broughton, who discussed the work of Dr. James H. Higgins, the "first agricultural State chemist"; C. S. Richardson, who told of Charles B. Calvert, the Pioneer of Agricultural Education, who did much to arouse interest in the establishment of the college; Dr. A. F. Woods, director of scientific work, U. S. Department of Agriculture, who discussed Maryland's Contribution to National Agriculture; and President R. A. Pearson, who spoke on The University of Maryland's Future.

Massachusetts College.—Charles H. Thompson, since 1915 assistant botanist, assistant professor of horticulture, and professor of horticulture, died January 23 at the age of 60 years. Prof. Thompson was a native of California, but graduated from the Kansas College in 1893 and received the M. S. degree there in 1898. He had also been connected with Washington University, the Missouri Botanical Gardens, the University of Missouri, and the U. S. D. A. Forest Service and the Bureau of Plant Industry. He was an effective teacher, especially in general botany and landscape architecture, with a wide knowledge of cultivated plants, and a capable field botanist.

Cornell University and Station.—Two members of the original faculty of the New York State College of Veterinary Medicine died in February. These were Dr. Veranus A. Moore, dean from 1908 to 1929, who passed away on February 11 at the age of 71 years, and his successor Dean Pierre A. Fish, who died February 19 at the age of 66 years. Both were natives of New York State and graduates of Cornell University (1887 and 1890, respectively). Dr. Moore also received the M. D. degree from Columbian University in 1890 and subsequently the D. V. M. degree in 1911 from the University of Pennsylvania and the D. Sc. degree from Syracuse University in 1919, while Dr. Fish was granted the D. Sc. and D. V. M. degrees from Cornell in 1894 and 1899, respectively.

From 1887 until his return to Cornell as professor of comparative pathology, bacteriology, and meat inspection in 1896, Dr. Moore was engaged in the investigation of infectious diseases for the U. S. D. A. Bureau of Animal Industry and as chief of its division of animal pathology. He was the author of numerous publications, including a history of veterinary education and service at Cornell from 1896 to 1929. Of him President Farrand of the university has said: "For more than 40 years Dean Moore played an important part in the building of the university. It was not alone his unchallenged leadership in the field of veterinary medicine that gave him his peculiar influence. It was not even his sturdy insistence upon the best scientific standards that won the admiration of his colleagues in all the faculties. It was the sterling character of the man and the simple, winning, sympathetic personality that gave to his professional leadership its unusual touch."

Dr. Fish likewise had been connected with the Bureau of Animal Industry, but from 1890 to 1895 was instructor in the department of physiology, vertebrate zoology, and neurology in the university. From 1915 to 1918 he was editor of the *Journal of the American Medical Association* and a major in the veterinary corps of the U. S. Army in 1918–19. He wrote numerous manuals

on laboratory courses in veterinary physiology, as well as many articles for scientific journals. Of him it has been said by one of his colleagues in the original faculty, "as dean of the college for the last two years, he has fully maintained the high excellence set by his two predecessors, Dr. Law and Dr. Moore."

North Carolina College.—A Christmas gift to the college of a tract of 721 acres to be used for forestry demonstration work has been made by George Watts Hill of Durham, who had previously given 378 acres for the same purpose.

Pennsylvania Station.—A soil fertility conference commemorating the fiftieth anniversary of the establishment of the soil fertility plats at the college, open to all who are interested, will be held June 24–26. A technical program based on detailed studies of these plats will be presented by the college and station staff, assisted by soil specialists from other institutions, and with Dr. W. H. Jordan, who laid out the plats in 1881, as the guest of honor. The program will include two half days of technical papers, two half days of excursions to the plats, and one half day for an open forum on soil fertility problems. Special inspection trips to the orchard and gardens will also be arranged.

Virginia College and Station.—C. C. Taylor, professor of agricultural economics and agricultural economist, has accepted a position with the U. S. D. A. Bureau of Agricultural Economics. Dr. H. N. Young, associate agricultural economist, has been appointed acting head of the department of agricultural economics and rural sociology.

Necrology.—Dr. Felix Löhnis, widely known for his contributions to agricultural bacteriology research, died at Leipzig December 8, 1930. Dr. Löhnis was born in Dresden August 3, 1874, and received his Ph.D. degree from the University of Leipzig in 1901. From 1903 to 1914 he was head of the laboratory of agricultural bacteriology in the university. In 1914 he accepted an appointment in the U. S. Department of Agriculture as soil bacteriologist, and in 1923 he was given charge of the office of soil bacteriology investigations in the Bureau of Plant Industry. He resigned in 1925 to return to Leipzig as professor of agricultural bacteriology and soil science in the university and head of the Institute of Agricultural Bacteriology and Soil Science. In 1929 he also became editor of Abt. II, *Zentralblatt für Bakteriologie*. Among his extensive writings may be noted his compilation of the Handbuch der Landwirtschaftlichen Bakteriologie, a new edition of which was nearing completion at his death.

Frederick J. Pritchard, since 1910 connected with the plant breeding and disease work of the U. S. D. A. Bureau of Plant Industry, died January 13 at the age of 56 years. He was a native of Iowa and a graduate of the University of Nebraska in 1904. From 1904 to 1911 he was engaged in teaching and research in the North Dakota College and Station and Cornell and Wisconsin Universities. His work with the Department had been largely in the breeding of sugar beets and disease-resistant tomatoes, the latter including the well-known Marglobe, Norton, Marvel, Greater Baltimore, and Arlington varieties.

Abstracts in Sugar Technology.—*Facts About Sugar*, which absorbed *The Planter and Sugar Manufacturer* and *Sugar* a short time ago, announces that arrangements have been made for publishing in its columns all abstracts prepared by members of the International Society of Sugar Cane Technologists. These abstracts will deal with both agricultural and manufacturing phases of the cane sugar industry and the manufacture of beet sugar. Reprints of the abstracts are to be furnished in more convenient page form.

EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The chemical action of quinones on proteins and amino acids, Part II, E. A. COOPER and R. B. HAINES (*Biochem. Jour., 23 (1929), No. 1, pp. 4–9, fig 1*).—"In the case of quinone . . . the chemical interpretation [of the bactericidal behavior] already put forward [E. S. R., 60, p. 413], whilst entirely consistent with many observations, does not at the present time account for the high temperature coefficient for germicidal action." A possible mechanism for the reaction between quinone and related compounds and amino compounds and proteins is indicated. The behavior of toluqninone and xyloqninone is also briefly considered.

Note on the characterisation of the anthocyanins and anthocyanidins by means of their color reactions in alkaline solutions, A. ROBERTSON and R. ROBINSON (*Biochem. Jour., 23 (1929), No. 1, pp. 35–40*).—The color assumed and other behavior are here recorded for the chlorides of apigeninidin, pelargonidin, cyanidin, 5-0-benzoylcyanidin, peonidin, malvidin, cyanin, and malvin in buffer solutions of the pH values 3.2, 3.8, 4.4, 5.0, 5.6, 6.2, 6.8, 7.4, 8.0, 8.6, 9.2, 9.8, 10.4, 11.0, and in two more alkaline solutions of which the pH values are not stated.

Natural anthocyanin pigments, I, II, R. SCOTT-MONCRIEFF (*Biochem. Jour., 24 (1930), No. 3, pp. 753–766, figs. 6; pp. 767–778, figs. 3*).—These two papers report contributions from Cambridge University, with photomicrographs.

I. *The magenta flower pigment of Antirrhinum majus.*—The isolation is reported of a magenta anthocyanin, here named antirrhinin, in the form of a crystalline chloride.

"Antirrhinin is shown to be a 3-rhamnoglucoside of cyanidin. It is probably identical with keracyanin, the pigment of the fruit of the cherry, but differs from sambucin from the elderberry. The identification of antirrhinin as a cyanidin compound contradicts the theory of a simple relationship between this pigment and the ivory flavone apigenin, which is indicated by a study of the Mendelian factors for flower color in Antirrhinum."

II. *The magenta flower pigment of Primula polyanthus.*—The work here described led to the isolation and characterization of an anthocyanin designated primulin, of which it is stated that "by extraction of the pigment with dilute hydrochloric acid and purification through the picrate, pure crystalline primulin chloride has been prepared, and shown to consist of 3-monoglucosidylmalvidin chloride, together with traces of a lower methylated compound. By comparison of the properties and reactions of the chlorides of primulin and oenin and of the sugar-free pigments primulidin, oenidin, and malvidin, it is

shown that, although of nearly the same constitution, primulin and oenin are not identical. Primulin furnishes the same aglucone as the pigments of *P. viscosa* and *P. integrifolia*, but differs from them in the nature and position of attachment of its glucosidal residue."

The reduction of methylene blue in milk.—The influence of light, H. R. Whitehead (*Biochem. Jour.*, *24* (*1930*), *No. 3*, *pp. 579–584*).—It was the observation of the author of this contribution from the University of New Zealand that when methylene blue was added to fresh milk of good quality and the mixture exposed to sunlight at 37° C., reduction was complete "in a short time" (figures as low as 0.5 hour are given), whereas "in darkness at 37° no decoloration occurs within 7 hours."

That the reduction in sunlight was not due to an enzyme is considered to have been shown by the fact that "it proceeds equally well in milk which has been heated to 100° for 30 minutes." Further, "milk from which the fat has been removed by centrifugal separation no longer gives the reaction, but the activity of the milk can be restored by an addition of sodium oleate. Sodium palmitate has not a similar action. It is suggested that sunlight catalyzes an oxidation-reduction reaction in which unsaturated fats are oxidized and methylene blue is reduced."

The characteristic absorption of ultra-violet radiation by certain purines, E. R. Holiday (*Biochem. Jour.*, *24* (*1930*), *No. 3*, *pp. 619–625*, *figs. 2*).—Ultra-violet absorption spectra were determined for uric acid, guanine, adenine, hypoxanthine, caffeine, theobromine, and ergothioneine. The purines named showed no exception to Beer's law. Combination of the purines as a nucleoside or nucleotide did not alter the observed absorption. It is added that "the effect of hydrogen ion concentration on the absorption spectra has been measured and its importance emphasized."

Effect of method of rendering on the refractive index of fats, H. W. Block (*Jour. Assoc. Off. Agr. Chem.*, *13* (*1930*), *No. 1*, *pp. 142–146*).—A brief contribution from the Indiana Experiment Station reports the result of heating fat tissue for prolonged periods in open dishes as an increase in the refractive index of the fat due to oxidation. This oxidation was largely prevented by heating in a nitrogen atmosphere. "Autoclaving the adipose tissue fat 8 hours at 15 lbs. pressure in sealed tubes is preferable to the other methods tried, since the fat can easily be obtained free from the effects of oxidation."

Studies on pectin, III–V (*Biochem. Jour.*, *22* (*1928*), *No. 3*, *pp. 749–752*; *24* (*1930*), *Nos. 2*, *pp. 402–409*; *3*, *pp. 649–660*).—The three papers here noted continue a series, to which reference has already been made (E. S. R., 60, p. 417), of contributions from the University of Birmingham, England.

III. *The degree of esterification of pectin in the juice of the lemon*, A. G. Norman.—Special precaution having been taken to obtain a preparation of pectin from its solution in lemon juice without the possibility of partial de-esterification during the processes of isolation, it was found possible to secure a substance of which the apparent methoxyl content corresponded to that of a trimethoxylated derivative of pectic acid; but "if a correction for the calcium pectate yield of the preparation is employed—the only criterion of purity known—then the corrected figures for methoxyl approach the theoretical value for tetramethylpectic acid."

Further, "it is claimed that no good evidence exists for stating that the soluble pectic substance exists uniformly in the trimethoxylated condition; and that it must be regarded as being almost completely esterified. Some other material, probably pectin degradation products, giving a furfural yield similar to that of pectin, is associated with pectin in such preparations."

IV. *The oxidation of pectin by Fenton's reagent and its bearing on the genesis of the hemicelluloses*, A. G. Norman and F. W. Norris.—"The purpose of this investigation was to isolate certain degradation products of pectin by means not dissimilar to those possibly obtaining in the living plant." It was found that the pectin was readily oxidized by Fenton's reagent (hydrogen peroxide with ferrous acetate as catalyst), the reaction being exothermic and requiring temperature control of such character as to hold variations in temperature between the limits 30 and 35° C. The products of the reaction were "mixtures, yielding on hydrolysis galactose and galacturonic acid. They are possibly polymers containing mainly galactose-monogalacturonic acid and galactose-digalacturonic acid, although the presence of other conjugated acids containing galactose and galacturonic acid is not ruled out. The products resemble in appearance and general properties the structural hemicelluloses, such as those obtained from wheat bran, beech wood, and cereal straws. Some support is lent to the view that the hemicelluloses may be formed in nature by the protracted mild oxidation of pectin."

V. *The hydrolysis of pectin*, A. G. Norman and J. T. Martin.—"Hydrolyses of pectin have been carried out at 100° with 0.5 per cent and 0.2 per cent alkali. The yields of calcium pectate, furfuraldehyde, and CO_2 were estimated at intervals.

"A rapid hydrolysis was observed in both cases, the rupture of the pectin ring proceeding faster than the destruction of furfuraldehyde-yielding groups and apparent decarboxylation. When a calculation was made to determine the nature of the immediate degradation products of the pectin, certain discrepancies became apparent. The CO_2 yield was higher than could be accounted for from the uronic acids present. On theoretical grounds the presence of certain dienolic fission products of sugars was suspected, and the CO_2 yields of these were tested. Pyruvic acid was found to yield a considerable amount of CO_2 and oxalic and lactic acids a little. There is therefore indirect evidence for their presence in the alkaline hydrolysis liquid. In the course of mild acid hydrolyses an increase in furfuraldehyde yield was observed, due to simple decarboxylation of uronic acids with the production of pentose. Despite this decarboxylation, an increase of CO_2 yield was noted, owing to the formation of nonuronic degradation products of unknown composition, yielding CO_2. A polyuronide derivative of pectin containing 57 per cent uronic anhydride was prepared by alkaline hydrolysis of pectin, and its composition was determined."

The inactivation of trypsin by heat, J. Pace (*Biochem. Jour.*, *24* (*1930*), *No. 3*, *pp. 606–614*, *fig. 1*).—The heat inactivation of trypsin so far purified as to be free from enterokinase and its pre-stage was found to follow the equation of a unimolecular reaction. "The importance of this purification of an extract of pancreas is emphasized on account of the complicating effect of the 'spontaneous activation' of the enzyme which otherwise occurs."

In its relation to H-ion concentration trypsin was found to be most stable at about pH 6.5, on either side of which point the rate of destruction of the enzyme increased markedly. "The pH stability curve is similar in shape to that obtained for the effect of pH upon the rate of heat denaturation of proteins."

Further, "the critical increment for the heat-inactivation process has been determined (a) in the alkaline region, (b) in the acid region, [and] (c) at the region of optimum stability. It is found that the critical increment is sensibly the same at all three points and is of the order of 40,000 calories per molar unit of enzyme."

Further observations on the relation of carotene to vitamin—A, J. C. Drummond, B. Ahmad, and R. A. Morton (*Jour. Soc. Chem. Indus.*, *Trans.*, *49* (*1930*), *No. 27*, *pp. 291T–296T*, *figs. 10*).—Data are given showing that the nega-

tive results reported by Dulière, Morton, and Drummond (E. S. R., 63, p. 8) in their investigation of purified carotin as a source of vitamin A in feeding experiments with rats were due to the destructive effect upon carotin of the ethyl oleate used as solvent, as has been pointed out by Hume and Smedley-Maclean (E. S. R., 63, p. 792). The authors now recommend in place of ethyl oleate as solvent ethyl laurate, prepared free from unsaponifiable constituents.

Evidence is also given that, contrary to an early claim of Von Euler, dihydro-α-crocetin is incapable of replacing vitamin A in feeding experiments, that some samples of palm oil are of unusual potency as a source of A, and that, as determined by spectrographic analysis, carotin is converted in the animal body into vitamin A. The authors suggest in conclusion that the discovery of the interrelation of carotin and vitamin A points to a simplification of methods of determining vitamin A in food materials. "The determination of the carotin content of foodstuffs should prove to be a matter of comparative simplicity, whereas a method of assay of vitamin A based on spectrographic examination is of very much greater promise than the present extremely crude biological tests."

A chemical reaction of the antirachitic vitamin [trans. title], E. CRUZ-COKE (*Compt. Rend. Soc. Biol. [Paris], 105 (1930), No. 28, pp. 238, 239*).—According to the author a white precipitate is formed on the addition of a few drops of hydrochloric acid to an alcohol solution of pure ergosterol heated at 70 to 80° C. With ergosterol irradiated in an atmosphere of nitrogen to avoid any oxidation phenomena, the precipitate with hydrochloric acid appears more slowly and subsequently dissolves with the formation of a green color, this becoming more intense with increasing amounts of hydrochloric acid until a precipitate is again formed. It is said to be possible to detect 0.5 mg. of activated ergosterol by means of this color test.

The formation of vitamin D by monochromatic light, A. L. MARSHALL and A. KNUDSON (*Jour. Amer. Chem. Soc., 52 (1930), No. 6, pp. 2304–2314, figs. 7*).—The authors, using monochromatic light of various wave lengths obtained from several intense sources, first determined the effect of varying light intensities on the minimum daily dose of irradiated ergosterol necessary to show the first incidence of healing in rats, following the technique of Knudson and Moore (E. S. R., 61, p. 495). Then, varying the wave lengths (from 302.2$\mu\mu$ to 230$\mu\mu$) and the time of exposure, they calculated the rate of production of vitamin D with results which they summarize as follows:

"The rate of production of vitamin D from ergosterol is proportional to the first power of the light intensity. The rate of production of vitamin D is directly proportional to the number of light quanta absorbed by ergosterol and independent of the wave length of the light used. Vitamin D absorbs in the same wave length region as ergosterol and is destroyed by light of the same wave length as that which forms it. The highest concentration of vitamin D which can be produced by direct irradiation of ergosterol is 35 per cent. This is an absolute maximum, and the probable value is lower. The quantum efficiency is 0.3 molecule of vitamin D per quantum of light absorbed."

Antiricketic substances.—X, On the relation of the isoergosterols to vitamin D, W. M. COX, JR., and C. E. BILLS (*Jour. Biol. Chem., 88 (1930), No. 3, pp. 709–713, fig. 1*).—In continuation of the series of studies noted previously (E. S. R., 61, p. 294), the authors have compared the vitamin degradation product obtained in slightly over-irradiated ergosterol with isoergosterol by determinations of the absorption curves of a typical ergosterol, a typical isoergosterol, and mixtures of the two in ratios of ergosterol to isoergosterol of 20:80, 40:60, 60:40, and 80:20. The curve of the 60:40 mixture resembled

very closely that of the slightly irradiated ergosterol, thus pointing to the identity of the degradation product with isoergosterol. The degradation product, however, unlike the known isoergosterols does not form a precipitate with digitonin. It is suggested that the product is probably the same as the substance B of Bourdillon et al. (E. S. R., 62, p. 114), although these authors place its maximum at 240$\mu\mu$ instead of 248$\mu\mu$ as in the present study.

The relation between cystine yield and total sulphur in wool, C. RIMINGTON (*Biochem. Jour., 23 (1929), No. 1, pp. 41–46, fig. 1*).—"It may be concluded from these experiments that natural wools differing markedly in their sulfur content (3.34 to 4.08 per cent—nearly the extremes of variation encountered) and also fine and coarse samples of Turkey mohair are all capable of yielding their entire sulfur as cystine when hydrolyzed by acids. There is no evidence of any other sulfur compound entering into their constitution."

Similar work of the same author has recently been noted (E. S. R., 62, p. 609).

The chemical aspect of the drying of timber, W. G. CAMPBELL and J. BOOTH (*Biochem. Jour., 24 (1930), No. 3, pp. 641–648*).—In both air- and kiln-drying the total pentosan content as indicated by the furfuraldehyde produced was lowered, whereas the pentosan content of the cellulose was increased, as was also the lignin. Oven-drying resulted in an increase in the lignin content and some degree of hydrolysis of the carbohydrate components, effects found to be more marked in the heartwood than in the sapwood.

Well-regulated kiln-drying appeared closely comparable to ordinary air-drying, but "if conditions in a kiln should become so drastic as to approach those obtaining an oven-drying treatment, decomposition of the wood substance would be imminent." It appeared that softwoods are more readily kiln-dried than are hardwoods, because the softwoods "invariably contain less pentosans than hardwoods, so that drying conditions which might be severe enough to hydrolyze the pentosans of wood would always affect hardwoods more than softwoods."

The biochemistry of dry-rot in wood, E. C. BARTON-WRIGHT and J. G. BOSWELL (*Biochem. Jour., 23 (1929), No. 1, pp. 110–114*).—The experiments reported in this contribution from King's College, University of London, led to the conclusion that "the effect of the fungus *Merulius lachrymans* (the cause of dry rot in wood) is to remove the galactan, mannan, and cellulose fractions in spruce wood; the hemicelluloses and lignin are not affected, i. e., no delignification of the woody tissues takes place."

The bactericidal action of the nitroso compounds, E. A. COOPER and R. B. HAINES (*Biochem. Jour., 23 (1929), No. 1, pp. 10–16, figs. 2*).—It was found in the experiments reported in this contribution from the University of Birmingham, England, that "an essential condition for the bactericidal action of the nitrosoanilines is the maintenance of the amino nitrogen in the tervalent state. The hydrochloride and methiodide are weak germicides. The nitroso compounds are slowly acting disinfectants, exerting only a small bactericidal action in short periods, but this increases greatly in intensity in periods of 24–48 hours. The nitroso compounds have little or no action on amino acids and proteins, but react gradually with nucleic acid forming a dark green insoluble product.

"It is concluded therefore that the nitroso compounds owe their slow germicidal action and marked inhibitory power to their gradual chemical interaction with the nuclear constituents of the cell, thus interfering with and retarding the biochemical mechanism of growth."

Analytical sublimation with special reference to the field of microsublimation, H. HOFFMANN, JR., and W. C. JOHNSON (*Jour. Assoc. Off. Agr.*

Chem., *13 (1930)*, *No. 3*, *pp. 367–377*, *pls. 4*, *fig. 1*).—The authors of this contribution from the Minnesota State Department of Agriculture find that "in all cases the 'sublimation point' is lower when determined in vacuo than when determined under atmospheric pressure, and this fact shows clearly that sublimation is dependent upon the vapor pressure. . . . This work also shows that sublimation can be used to advantage in both quantitative and qualitative analysis."

Sublimation temperatures observed in vacuo by means of the Hortvet sublimator and at ordinary pressure in an apparatus of which the design is here shown are tabulated for 62 substances, together with the time required for quantitative sublimation and the melting points and related data compiled from various sources. Photomicrographs × 50 or × 140 are given in the case of each of the following: Coumarin, codeine, cholesterol, catechol, strychnine, sulfur, urea, vanillin, furoic acid, hexamethylenetetramine, mercuric chloride, mercurous chloride, santonin, saligenin, salicylic acid, saccharin, morphine, oxalic acid, pyrogallic acid, resorcin, cantharidin, caffeine, β-naphthol, benzoic acid, aspirin, anthranilic acid, acetanilide, and arsenious oxide.

On the question of the pH determination in water and in potassium chloride solutions [trans. title], H. Elleder (*Ztschr. Pflanzenernähr., Düngung u. Bodenk.*, *16 (1930)*, *No. 5–6*, *pp. 283–289*).—The author appears to have found a more or less proportional rise in pH value with an increasing calcium carbonate content in the soil, in the case of determinations carried out in potassium chloride solution, but considers it very probable that neither the calcium carbonate nor the total calcium content, but rather the content of both calcium carbonate and calcium oxide in conjunction with that of magnesia are to be credited with a proportional relation to the pH shift.

In all the determinations made, it is stated, the sum of the alkaline earth oxides appeared to have a definite influence, although the part played by the magnesia would require fuller demonstration on a broader basis before it could definitely be decided that the calcium carbonate content was not alone responsible for the effects observed.

An improved method of fusion for soils, J. H. Dennett (*Malayan Agr. Jour.*, *16 (1928)*, *No. 11*, *pp. 372, 373*).—The usual fusion mixtures were observed not to effect complete decomposition of soil samples even after two hours' heating over a blast lamp. Fusion with potassium hydroxide was found feasible if the caustic was first fused and heated until frothing ceased, and if nickel dishes were substituted for the more usual platinum, the latter metal being attacked by the fused alkali. The alkali could be cooled in a desiccator and refused when needed.

"A homogeneous fusion is obtained in a few minutes, and the most refractory soils are complete in a quarter of an hour. The crucible and contents are allowed to cool, and when at a temperature of about 100° C. are carefully placed in a 600-cc. beaker containing 150–200 cc. of water. The mass readily detaches from the crucible, which is rinsed with distilled water and removed from the beaker. HCl is added to the beaker until solution is complete and the solution filtered to remove any carbon and oxide of nickel which may be there. The filtrate is then treated in the usual way."

On a method for the determination of absorption capacity [trans. title], S. N. Aleschin (*Ztschr. Pflanzenernähr., Düngung u. Bodenk.*, *18 (1930)*, *No. 1*, *pp. 44–48*).—The paper presents two modifications of method as follows:

(1) Of the air-dried soil 10 gm. are treated two or three times by decantation with small quantities of normal barium chloride solution, and at once brought upon a single filter paper and washed with the same barium chloride solution

to the disappearance of the calcium reaction (test with ammonium oxalate after removing barium with an alkali chromate). After all other cations have been driven out by the barium, the excess barium chloride is washed out with water to the disappearance of the chloride reaction. The soil sample residue is then dried in the oven, and, with the filter paper is placed in a Stohmann flask. The drying eliminates the necessity for a dilution correction. The sample is now treated with 500 cc. of exactly 0.05 N sulfuric acid, is shaken for 5 minutes, and is filtered on an extra hard folded paper. An exactly measured aliquot of the filtrate is titrated with 0.1 N alkali and from the difference in titer between the acid added and that titratable in the filtrate is calculated the absorption capacity of the soil.

(2) In the second modified procedure, after the saturation of the soil with barium the barium chloride remaining is not washed out but the sample is directly treated with the sulfuric acid and the titration made as in the preceding form of the method.

Systematic investigation of the reaction of diphenylamine-sulfuric acid reagents with nitrate in the presence of chloride, with particular reference to their application to the determination of nitrate in arable soil [trans. title], H. RIEHM (*Ztschr. Analyt. Chem., 81 (1930), No. 10–11, pp. 353–377*).—The following reagents and procedure are prescribed:

Reagents.—(1) The nitrate reagent—this is to consist of 50 mg. of a highly purified preparation of diphenylamine and 380 cc. of water made up with concentrated sulfuric acid to a volume, at room temperature, of 1 liter. The sulfuric acid must be prepared for this use by boiling for 15 minutes with about 5 gm. of potassium chloride to a liter of the acid. (2) The nitrate solution for comparison—this is a solution of 163 mg. of potassium nitrate in a liter of 2 per cent potassium chloride. (3) A 2 per cent solution of nitrate-free potassium chloride.

Determination.—Shake 5 gm. either of the fresh soil, or of a sample dried 3 hours at 90° C., with 50 cc. of the 2 per cent potassium chloride solution for ½ hour and filter. Treat 2 cc. of the filtrate with 5 cc. of the nitrate reagent, shake thoroughly, cool to room temperature, shake again, and let the mixture stand for 2 hours. At the same time prepare the comparison scale by diluting the nitrate solution with the 2 per cent potassium chloride solution to obtain solutions of 20, 6, and 3 mg., respectively, of the nitrate ion to the liter, carrying out the reaction with these solutions as directed for the sample solution. Prepare the comparison scale proper by making as many dilutions of the 20-mg. standard as will provide scale steps enough for the degree of accuracy required, using the 3- and 6-mg. standards as checks for the dilutions of the 20-mg. solution. If agreement of the solutious with the standards representing 3 and 6 mg. of nitrate to the liter is obtained, the samples are compared with the colors of the comparison scale.

It is noted that immediate development of a blue color in the preparation of the sample tube indicates the presence of nitrite. This is to be determined and quantitatively destroyed by means of urea.

The colorimetric estimation of phosphorus in acid soil extracts, W. N. C. BELGRAVE (*Malayan Agr. Jour., 16 (1928), No. 11, pp. 361–371*).—The following procedure is prescribed:

"A quantity of extract equivalent to 1 gm. of soil (prepared by any of the usual methods) from which organic matter, any large quantity of silica, and nitric acid have been removed by gentle ignition, is taken up in a small quantity of strong HCl, and if necessary filtered and any residue washed, 2–3 gm. of pure granulated (lump) zinc and 3 or 4 cc. of 1:1 HCl are added, and the

whole gently warmed. When all yellow color has disappeared and only the faintest yellow brown color is given to a 'spot' of ammonium thiocyanate, and before the whole of the acid present has been used up by the zinc (i. e., while hydrogen is still being freely evolved), the solution is rapidly filtered through a light cotton wool plug into a 100-cc. graduated flask and made to the mark.

"To an appropriate aliquot (40 cc. for our mineral soils with a P_2O_5 content of 0.02–0.03 per cent) in a 50-cc. graduated flask or cylinder is added 3 drops of thymol blue (0.04 per cent) and then 5 M ammonium acetate drop by drop until the pink color just begins to fade: if carried too far dilute HCl must be slowly added till the color just reappears. Then is added 1 cc. of Atkins' Reagent A and 3 drops of Reagent B, the whole made to the mark, shaken, and allowed to stand at least 1.5 minutes before reading. Up to 15 minutes, there are negligible changes in the standard and test solutions. If the aliquot taken gives too deep a color . . . a repetition must be made with a smaller quantity. An equal number of drops of thymol blue must be added to 50 cc. of standard to secure a good match in the colorimeter. . .

"Differences of 0.02 mg. P_2O_5 can easily be seen in a series of 50 cc. Nessler cylinders containing 0.02 to 0.12 mg. P_2O_5 and comparison with these would be sufficient for practical purposes; it is, however, easier and more expeditious to use a colorimeter."

The advantages of this over previous forms of the ceruleo-molybdate method are indicated as being its provision for the preliminary reduction of ferric iron and for the control of the H-ion concentration.

On the determination of the root soluble soil phosphoric acid by the seedling method [trans. title], A. NĚMEC (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 16 (1930), No. 5–6, pp. 354–363*).—The author reports the results of experiments which would appear to make evident an important increase in the phosphate absorption of rye seedlings in the Neubauer procedure when nitrogenous fertilizers are added. He states that it is only after supplementary treatment with nitrogen fertilizers that soils subjected to the Neubauer analysis gave results in agreement either with the field experiment or with the chemical analysis.

A form of the phenoldisulfonic acid method for the determination of soil nitrates is detailed.

Citrate-soluble phosphoric acid in colloidal phosphate, J. B. MARTIN and E. C. SHOREY (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 1, pp. 133–136*).—From the U. S. D. A. Bureau of Chemistry and Soils is contributed the suggestion that, in the determination of water-soluble and of ammonium citrate-soluble phosphate in such phosphate samples as yield a colloidal dispersion of a portion of the sample, 2 per cent of ammonium chloride be added to the water and to the ammonium citrate solution used in the successive extractions, the principle being the well-known one of the flocculation of a colloidal dispersion by a strong electrolyte. When such dispersion of the phosphate sample occurred and the precaution noted was not taken, results as much too high as from 2 to 3 per cent in material containing a total of from 20 to 25 per cent were obtained.

As flocculating electrolyte, 2 per cent of ammonium nitrate was as effective as the same concentration of the chloride, and either was as effective as 10 per cent of sodium chloride. "When the after treatment of the insoluble residue is considered, 2 per cent ammonium chloride seems to be the preferable salt to use, especially if the ignition with magnesium nitrate is resorted to, since the salt is completely volatilized and does not fuse and leave a mass difficult to remove from the dish as is the case with sodium chloride."

Determination of silica in phosphate rock, W. L. Hill and K. D. Jacob (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 1, pp. 112–117*).—Determining silica in phosphate rock samples containing from nearly 2 to about 4 per cent of fluorine, the authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils showed that as a result of the presence of fluorine "the percentages of silica obtained by methods of ordinary rock analysis are 0.5–2.7 per cent lower than the percentages obtained by the modified Berzelius method."

The shortened form of the Berzelius method was also compared with the unmodified procedure, with the result that the modified method was shown to be applicable to the determination of the silica in phosphate rock.

The micro-determination of hydroxyl groups, P. M. and G. F. Marrian (*Biochem. Jour., 24 (1930), No. 3, pp. 746–752, fig. 1*).—A micromethod for the estimation of the percentage of hydroxyl in the higher fatty alcohols is here described in a contribution from the University College of London. The procedure is a modification in detail of a large scale method based on the action upon alcoholic hydroxyl of the Grignard reagent, methyl magnesium iodide, with the evolution of methane. It was found that "results accurate to ±8 per per cent are obtained when the alcohol is readily soluble in the ether of the Grignard reagent used. The use of pyridine to dissolve alcohols which are not soluble in the ether of the reagent is not recommended, the results being very unreliable owing to a variable blank." The pyridine appeared capable of entering the reaction with the result of an evolution of ethane.

A study of factors said to influence the nitrogen distribution of gelatin, F. S. Daft (*Biochem. Jour., 23 (1929), No. 1, pp. 149–160*).—The work here reported was conducted at the Carlsberg Laboratory, Copenhagen.

It is stated that "the experimental results force us to the conclusion that, within the limits of accuracy of the method described, preliminary treatment of gelatin with acid or alkali has no effect on the percentages of nonamino nitrogen and of basic nitrogen." As a result of the study of certain other factors, however, some modifications of method were considered desirable, the procedure preferred being thus described:

"The protein is hydrolyzed by boiling with 20 per cent HCl. After removal of as much of the HCl as is possible by evaporation, the hydrolyzate is rendered alkaline by the addition of a known amount of MgO, CaO, or NaOH, and the ammonia is removed under the proper conditions. The residue is acidified and the humin is filtered off. The filtrate, of which the acidity is determined, is divided into aliquot portions; some of these are used for determinations of amino nitrogen and some for total nitrogen. In one portion the amino acids are divided into two groups by a precipitation with phosphotungstic acid. The concentrations of salt or of salts, of acid, and of nitrogen are always brought to definite values in this latter portion before the precipitation is allowed to take place. The solution of amino acids is heated almost to boiling before the phosphotungstic acid is added, and the resulting mixture is kept at a definite temperature during the definite time allowed for precipitation. The phosphotungstates are filtered off and are washed according to a rigidly defined technic.

"If determinations of the amino nitrogen of the filtrate and of the precipitate are to be made by the nitrous acid method only, no preparation of the filtrate is necessary, and the precipitate may be obtained in a suitable form by its solution in N NaOH. Should it be desirable to make use of the formaldehyde or alcohol titrations, the phosphotungstic acid is removed from each of the amino acid fractions by the amyl alcohol-ether method. The amino nitrogen and the total nitrogen of the filtrate and of the precipitate are determined."

Note on the determination of tryptophan by means of p-dimethylaminobenzaldehyde, W. J. Boyd (*Biochem. Jour.*, *23* (*1929*), *No. 1*, *pp. 78–82*).—*The author notes the possibility of introducing error in the May and Rose tryptophane determination* (E. S. R., 48, p. 312).

"*The development of the color is an oxidation process* which goes on slowly in dull light and more rapidly in bright light. It is not nearly complete *in a period of 4 weeks in ordinary diffuse daylight in the laboratory. It can* conveniently be hastened by adding a trace of an oxygen carrier or oxidizing agent after *hydrolysis of the protein. In carrying out the test 3 drops of 0.5* per cent sodium nitrite solution should be added to the reaction mixture after 24 hours' incubation at 36° and 3 days at room temperature and again after a further 3 days, the colorimetric comparison being made next day or later. By this modified method higher values for the tryptophane content of cod muscle protein and edestin are obtained than by the unmodified method of May and Rose."

The determination of small quantities of starch in vegetable tissue, E. J. B. Bish (*Biochem. Jour.*, *23* (*1929*), *No. 1*, *pp. 31–34*, *fig. 1*).—A copper reduction procedure was calibrated against the product of the digestion of diastase of Lintner's soluble starch. The plant material (bracken fern rhizome "was washed in water, killed by immersion in a bath of boiling methylated spirit to which sufficient ammonia (sp. gr. 0.8) had been added to make the total concentration of ammonia 1 per cent, and dried for 24 hours at 105°. The weight was then constant, as far as constant weight is possible with hygroscopic material. The dried material was powdered and could then be stored in well-stoppered bottles without showing any fungus growth even after 3 years."

Prior to the starch determination proper this material was extracted in a Soxhlet apparatus for 24 hours with absolute alcohol, dried at 105°, and the loss in weight determined. "This extraction removed the sugars, chlorophyll, and some of the proteins, and also rendered the material more easily soakable with water afterwards. Four to 10 gm. of the dry powder were weighed into a dry conical 125-cc. flask, emulsified with 40 cc. of water, and hydrolyzed in exactly the same manner as the standard starch. The reaction was stopped at the end of 24 or 48 hours by the addition of the reagent used for precipitating the remaining proteins, tannins, and mucilages." As precipitant for the last-named group of substances, suitable solutions either of lead acetate or of certain mercury salts were equally satisfactory, both having been without effect upon the copper-reducing power of the hydrolysis products. It is noted that the method is comparative only by reason of the differences in the reducing powers of starches from different natural sources.

Some observations on the determination of levulose with cupropotassium carbonate solution, H. A. Schuette and J. N. Terrill (*Jour. Assoc. Off. Agr. Chem.*, *13* (*1930*), *No. 1*, *pp. 93–98*).—To secure stability of the forms *of the Soldaini-Ost cupro-carbonate solution used, it was found necessary,* according to the results here reported from the University of Wisconsin, to *keep the copper sulfate and the potassium carbonate-bicarbonate mixture in* separate solutions, mixing shortly before using.

The principal *observation recorded was that of the dispersion of a part of* the cuprous oxide produced in attempts to determine levulose gravimetrically. The state of dispersion continued in *the* filtrate for from 24 to 48 hours, approximately.

"The levulose-copper equivalents of two modifications of the Soldaini-Ost solution have been determined. These equivalents are only valid if reduction is carried out for 2.5 hours at a temperature of 48.9°, and if filtration is

delayed sufficiently long enough to allow for the complete flocculation of the reduced copper oxide. Mathematical expressions have been derived for these equivalents."

A bibliography of papers on Soldaini and Ost's solutions is appended.

Some observations on the application of the formol titration to honey, H. A. SCHUETTE and V. TEMPLIN (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 1, pp. 136–142, fig. 1*).—In a brief contribution from the University of Wisconsin, report is made of the finding that in 15 normal honeys the average formol titration value was 0.4 cc. of 0.1 N alkali for a 20-gm. sample, the minimum having been 0.25 and the maximum 0.76 cc.

It is considered that the initial value is too small to give this determination a value in detecting adulteration of honey with invert or glucose sirup. Also, "in the light of the evidence herein reported, it may be said that the formol titration value does not afford an accurate measure of the protein content of honey."

Identification of flavoring constituents of commercial flavors.—I, Optical properties of the semicarbazones of certain aldehydes and ketones, J. B. WILSON and G. L. KEENAN (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 3, pp. 389–397, pls. 2*).—"The semicarbazones of six aldehydes and seven ketones found in flavoring materials were prepared and analyzed for purity, and their optical properties were ascertained by the immersion method" by the authors of this contribution from the U. S. D. A. Food, Drug, and Insecticide Administration. Photomicrographs of the semicarbazones of acetophenone, anisic aldehyde, benzaldehyde, benzylidine acetone, carvone, ethylprotocatechuic aldehyde, *p*-methylacetophenone, β-thujone, and vanillin are also given.

"The method given for the identification of these aldehydes and ketones can be applied when only a few centigrams of the substance are available. The determinative data are given in tabular form for the convenience of the analyst."

Determination of citric acid in fruits and fruit products, B. G. HARTMANN and F. HILLIG (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 1, pp. 99–103*).—As their second contribution on the determination of citric acid by precipitation as pentabromacetone (E. S. R., 60, p. 614), the authors of this paper from the Food, Drug, and Insecticide Administration, U. S. D. A., report a procedure dependent upon the precipitation of lead citrate, the decomposition of this salt with hydrogen sulfide, and a final precipitation of the brominated derivative as described in the preceding paper. The new method was tested upon mixtures of pure acids and on fruit products, and the noninterference of malic acid, tartaric acid, and isocitric acid was demonstrated.

The following reagents, procedure, and method of calculation are prescribed:

"*Reagents.*—Potassium bromide solution—dissolve 15 gm. of potassium bromide in 40 cc. of water. Potassium permanganate solution—dissolve 5 gm. of potassium permanganate in water and dilute to 100 cc. Ferrous sulfate solution—dissolve 40 gm. of ferrous sulfate in 100 cc. of water containing 1 cc. of concentrated sulfuric acid. Lead acetate solution—dissolve 70 gm. of lead acetate in water, add 1 cc. glacial acetic acid, and dilute to 250 cc.

"*Determination.*—To the material in the centrifuge bottle, add a quantity of the lead acetate solution equal to 0.8 A, shake vigorously for 2 minutes, and centrifuge at about 900 r. p. m. for 15 minutes. Carefully decant the supernatant liquid from the precipitated lead salts. If sediment lifts, repeat the centrifuging, increasing the speed and time. Allow to drain thoroughly by inverting the bottle for several minutes. To the material in the centrifuge bottle add 150 cc. of 80 per cent alcohol, shake vigorously, and again centrifuge, decant and drain. Transfer the salts to a 400-cc. beaker with about

150 cc. of water. Warm, and pass in a rapid stream of hydrogen sulfide until the solution is cool, stirring frequently. Transfer to a 250-cc. volumetric flask, make to mark with water, and filter through a folded filter. Transfer 225 cc. of the filtrate to a 500-cc. Erlenmeyer flask, add several small glass beads to facilitate boiling, and evaporate to about 75 cc. Cool, and add 10 cc. of dilute sulfuric acid (1+1) and 5 cc. of the potassium bromide solution. Heat the mixture to 48–50° C. and maintain this temperature for 5 minutes. To the warm solution add immediately 50 cc. of the potassium permanganate solution; shake vigorously in the stoppered flask for about 1 minute, releasing the pressure frequently; and allow to stand 4 minutes. Do not permit the temperature to exceed 55°. *(During this time there should be a heavy* deposit of manganese dioxide; if necessary, add more potassium permanganate to assure an excess of the oxidizing agent. If at any time during the oxidation the precipitated mangagnese dioxide disappears, discard the determination and repeat, using more potassium permanganate.) Remove manganese dioxide with the ferrous sulfate solution (20 cc. is generally sufficient), cool, shake vigorously, and place in the refrigerator overnight. Filter by decantation onto a thin, tightly-tamped pad of asbestos in a Gooch crucible (it is important that filtration be completed as quickly as possible). Note volume of filtrate and use this filtrate to transfer the precipitate to the crucible. Wash the contents of the crucible at once with 50 cc. of ice-cold water. Dry in a sulfuric acid vacuum desiccator and weigh. To remove the pentabromacetone, treat the contents of the crucible with three portions of 20 cc. each of alcohol and three portions of 20 cc. each of ether. Again dry and weigh. The difference in the two weights represents the weight of pentabromacetone. Calculate the citric acid by the following formula:

"$X=1.05\ (0.424P+0.017S)$, in which
X=milligrams of citric acid in aliquot,
P=weight of pentabromacetone in milligrams, and
S=volume of filtrate (cc.)."

Determination of tartaric acid in fruits and fruit products, B. G. HARTMANN and F. HILLIG (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 1, pp. 103–112*).—"The calcium racemate method requires a reagent that is expensive and not readily available, two precipitations are necessary, and the oxidation with potassium permanganate requires close attention. . . . The Official Method and the direct calcium racemate method, in which the pectin is not removed and the acids are not isolated, yield solutions which filter with difficulty, if at all."

The acid potassium tartrate method is therefore considered preferable, and the following sample preparation and analytical procedure are prescribed:

"*Preparation of sample.*—With products containing large quantities of sugars, such as jams and jellies, use 200 cc. of a sample solution prepared as described in Methods of Analysis, A. O. A. C., 1925, 209. In the case of fruit juices or products of similar nature use a portion of the material containing not more than 200 mg. of acid calculated as tartaric acid. Determine the acidity of the portion taken in terms of normal acid (titratable acidity). Adjust to a volume of approximately 35 cc., either by evaporation or by the addition of water, add 3 cc. of normal sulfuric acid, and heat to 50° C.

"Designate the acidity of the solution as 'A' (titratable acidity plus 3). Pour the contents of the beaker into a 250-cc. volumetric flask. Rinse the beaker with about 15 cc. of warm water and finally with 95 per cent alcohol, make to mark with 95 per cent alcohol, shake, allow to stand 15 minutes, and filter through absorbent cotton. Prepare the filter by shaping the cotton into

a large-sized funnel, using as thin a layer of cotton as is practicable. (Filtration is usually fast, but occasionally it is necessary to renew the cotton. In the latter case the liquid is squeezed onto the new filter.) During filtration cover the funnel with a watch-glass to retard evaporation of alcohol. Transfer 200 cc. of the clear filtrate to a 16-oz. centrifuge bottle.

"In the case of products containing alcohol, saponification is necessary. For this purpose adjust the volume of the portion taken to about 35 cc., add 3 cc. of normal KOH alkali in excess of that required for neutralization, heat to boiling, and allow to stand overnight. Add normal sulfuric acid equal to the total quantity of normal alkali added and 3 cc. in excess. Transfer to a 250-cc. volumetric flask as described previously. 'A' in this case equals the number of cubic centimeters of normal sulfuric acid added plus the titratable acidity of the material.

"*Determination.*—To the material in the centrifuge bottle add a quantity of lead acetate solution equal to 0.8 A, shake vigorously for two minutes, and centrifuge at about 900 r. p. m. for 15 minutes. The lead acetate solution is prepared by dissolving 70 gm. of lead acetate in water acidulated with 1 cc. of glacial acetic acid and diluting to 250 cc. with water. Carefully decant the supernatant liquid from the precipitated lead salts. If the sediment lifts, repeat the centrifuging, increasing the speed and time. Allow to drain thoroughly by inverting the bottle for several minutes. To the material in the centrifuge bottle add 150 cc. of 80 per cent alcohol, shake vigorously, and again centrifuge, decant, and drain. Transfer the salts to a 400-cc. beaker with about 150 cc. of water. Warm and pass in a rapid stream of hydrogen sulfide until the solution is cool, stirring frequently. Transfer to a 250-cc volumetric flask, make to mark with water, and filter through a folded filter. Transfer 225 cc. of the clear filtrate to a 400-cc. beaker, add several small glass beads to facilitate boiling, and evaporate to 20 cc. over a small flame. Neutralize with normal potassium hydroxide, using phenolphthalein as indicator, and add 3 drops of the alkali in excess. Add 2 cc. of glacial acetic acid and 80 cc. of 95 per cent alcohol slowly and with constant stirring. Chill in an ice bath, stir vigorously for 2 minutes, and place in the refrigerator overnight. Carefully decant the supernatant liquid onto a thin pad of asbestos in a Gooch crucible with a removable bottom, leaving about 25 cc. in the beaker. To the contents of the beaker add about 0.3 gm. of dry purified asbestos. Mix thoroughly and transfer to the crucible with three portions of about 15 cc. each of ice-cold 80 per cent alcohol, and finally wash the contents of the crucible with three portions of 15 cc. each of the ice-cold alcohol, sucking the crucible dry each time. Transfer the pad and precipitate to a 250-cc. beaker, with about 100 cc. of hot water, bring almost to boiling, and titrate with 0.1 N alkali, using phenolphthalein as indicator. To obtain the quantity of tartaric acid, multiply the number of cubic centimeters of 0.1 N alkali used by 0.015."

Determination of cream of tartar and tartaric acid in tartrate baking powders, B. G. HARTMANN (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 3, pp. 385–389*).—The author contributes the two methods following from the Food, Drug, and Insecticide Administration, U. S. D. A.

"*Total tartaric acid, cream of tartar, and tartaric acid.*—Transfer 2.5 gm. of the baking powder to a 250-cc. volumetric flask, add 100 cc. of distilled water of 50° C., and allow the mixture to stand 30 minutes, shaking occasionally. Make to mark with distilled water, shake, and run through a folded filter into a dry flask. Measure two portions of 100 cc. each of the filtrate into 250-cc. beakers and evaporate to 20 cc. To one portion add 3.5 cc. of normal potas-

sium hydroxide, 2 cc. of glacial acetic acid, and 80 cc. of 95 per cent alcohol. Treat the other portion in a similar manner, but use normal sodium hydroxide instead of normal potassium hydroxide. Place the beakers in a refrigerator for about 1 hour, stir vigorously for 2 minutes, and allow to remain in the refrigerator overnight. Collect the precipitate in a Gooch crucible on a thin, tightly tamped pad of asbestos. Wash the beaker thoroughly with ice-cold 80 per cent alcohol and finally wash the precipiate several times with the cold alcohol. Transfer the contents of the Gooch to the original beaker with hot water, heat to boiling, and titrate with 0.1 N alkali, using phenolphthalein as indicator. Designate the titration of the portion treated with potassium hydroxide as 'A' and that treated with sodium hydroxide as 'B.'

"*Calculations.*—Per cent total tartaric acid—$\frac{0.015(A)\times2.5\times100}{2.5}$ or 1.5 A; per cent cream of tartar—$\frac{0.0188(B)\times2.5\times100}{2.5}$ or 1.88 B; and per cent tartaric acid—$\frac{0.015(A-B)\times2.5\times100}{2.5}$ or 1.5 (A—B). . . .

"*Direct determination of tartaric acid.*—Transfer 1.25 gm. of baking powder to a dry 200-cc. measuring flask, add 50 cc. of chloroform, and allow to stand 5 minutes, shaking occasionally. Then add 100 cc. of alcohol saturated with cream of tartar and allow to stand 30 minutes, shaking occasionally. (The cream of tartar should be absolutely free of tartaric acid. Wash the c. p. salt repeatedly with distilled water, then with alcohol, and finally with ether. Dry at the temperature of boiling water. The saturated alcohol is prepared by adding about 20 gm. of washed and dried cream of tartar to 1 liter of absolute alcohol, shaking vigorously for several minutes, and allowing to stand 1 hour with occasional shaking. Shake immediately before using.) Make to mark with the alcohol, shake, and filter. Titrate 100 cc. of the filtrate with 0.1 N alkali, using phenolphthalein as indicator. Designate the alkali used as 'A' and calculate the percentage of tartaric acid in the baking powder by the following formula:

"Per cent tartaric acid=$\frac{2\,A\times0.0075\times100}{1.25}$ or 1.2 A."

A nonacid Babcock method for determining fat in ice cream, O. R. OVERMAN and O. F. GARRETT (*Illinois Sta. Bul. 360 (1930), pp. 391–406*).—The method found satisfactory requires the two reagents and the procedure thus described:

"Reagent A, the alcohol-ammonia mixture, is made up as follows: 75 cc. of C. P. ammonium hydroxide, 35 cc. of n-butyl alcohol, [and] 15 cc. of 95 per cent ethyl alcohol or denatured grain alcohol. This reagent should be kept in a glass-stoppered bottle.

"Reagent B is made up as follows: 200 gm. of trisodium phosphate, 150 gm. of sodium acetate, [and] 1 liter of water. Trisodium phosphate and sodium acetate of commercial grade are satisfactory. Clean tap water may be used instead of distilled water. The reagent remains in solution at ordinary temperatures but will partially crystallize on becoming cold. If crystallization takes place the crystals should be dissolved by warming before the reagent is used. The reagent does not seem to deteriorate on long standing."

The procedure is thus described: "Weigh 9 gm. of the well-mixed sample of ice cream into a Babcock milk-test bottle (8 or 10 per cent) or a 20 per cent ice cream test bottle. Add exactly 2.5 cc. of Reagent A from a burette or pipette. Mix thoroughly. Add 9 to 10 cc. of Reagent B and again mix thoroughly. The reagent may be measured in an ordinary 9-cc. acid measure or

in a 10-cc. pipette. Place the test bottle in a shallow water bath and heat the bath to boiling, continuing the heating for several minutes. Shake the contents of the bottle two or three times while heating. Usually at the end of 15 to 30 minutes the fat will separate and form a clear yellow layer on top of the liquid. The heating must not cease until the fat layer has definitely separated from the dark portion of the liquid and has become clear. After all the fat has separated, place the test bottle in the centrifuge and whirl 5-2-1 minutes, adding hot water as in the regular Babcock milk test except that the water must not be softened with acid. Place the bottle in a hot-water bath at 130 to 140° F. for 5 minutes. Read the test, measuring from the bottom of the fat column to the top of the upper meniscus. If an 8 or 10 per cent milk-test bottle is used, multiply the reading by two. . . .

"The method presented is fairly rapid, sufficiently accurate for commercial use, and is inexpensive. The operator must become completely familiar with the method in order to achieve success with it. A large number of determinations may be made concurrently."

METEOROLOGY

The great drought of 1930 in the United States, A. J. HENRY ET AL. (*U. S. Mo. Weather Rev., 58 (1930), Nos. 9, pp. 351–354; 10, pp. 396–401, fig. 1*).—This paper deals chiefly "with the various aspects of the drought as a meteorological phenomenon," comparing it with previous droughts dating back to 1871 and discussing causes, as follows:

"The secondary circulation, especially that branch which is associated with air movement about cyclonic systems, became weak and disorganized during the spring and early summer months of 1930. By midsummer a blanket of warm surface air had developed over the great interior valleys extending from the Gulf of Mexico to the Canadian border in which the normal temperature gradient with latitude had been destroyed. Beginning with the turn of the season in September, when the transfer of polar air equatorward normally sets in, the chief weather control as between cyclones and anticyclones passed definitely to the anticyclones. In September, 1930, anticyclones from the Hudson Bay region moved south-southeast and merged with the semipermanent high pressure over the Atlantic some distance east of the Carolina coast. In that position they served as a buffer to prevent cyclonic systems from moving up the Ohio Valley and spreading across the Appalachians into Atlantic Coast States. The effect of this control was to augment the tendency of the dry weather to maintain the status quo in the piedmont sections of Atlantic Coast States where drought still endures."

There are supplemental notes by Henry on drought conditions in the Canal Zone and precipitation in Canada; by H. B. Humphrey on the influence of trees and associated undergrowth on the rate of stream discharge; and by B. C. Kadel on stream-flow returns before the rains come.

The drought of 1930, J. B. KINCER (*Bul. Amer. Met. Soc., 12 (1931), No. 1, pp. 14–17*).—The conditions prevailing during this drought are briefly described, with tables showing periods of high temperature and rainfall deficiencies in different States.

"The actual water shortage, or the difference between that afforded by the rain that did fall and the normal, was enormous for this record-breaking drought. Twenty-seven States east of the Rocky Mountains had deficient precipitation each month, for periods ranging from 2 to 12 months, and the total shortage for these during the droughty periods was more than 700,000,000,000 tons of water. For the 8 States—Maryland, Virginia, West Virginia,

Kentucky, Ohio, Missouri, Indiana, and Illinois—most affected by the drought, the shortage was nearly 300,000,000,000 tons, and, in general, for each 100-acre farm, for the 3 summer months alone, it was about 60,000 tons."

How droughts occur, W. J. Humphreys (*Bul. Amer. Met. Soc., 12 (1931), No. 1, pp. 18–22*).—The author defines a drought as "a period of dry weather by or before the end of which vegetation is suffering from the lack of sufficient rainfall," and briefly discusses the causes of drought. He states that "we know . . . something of what causes droughts and how they tend to perpetuate themselves, but we can not yet predict their coming nor their going, nor how severe they will be."

Salinity of rain in Western Australia, N. T. M. Wilsmore and W. E. Wood (*Jour. Roy. Soc. West. Aust., 15 (1928–29), pp. XXII–XXX, pls. 2*).—Results of determinations of combined chlorine in rain collected at Perth during 100 of the 164 rainy days of 1926, and in smaller numbers of samples collected at other places in Western Australia, with relevant meteorological data, are reported, with the conclusion that so far as they go the data "tend to support the hypothesis that the chief source of the chlorine in the rain is sea spray carried inland. . . . The data seem to indicate a distinct correlation between the chlorine content of the rain and the landward wind movement during or immediately preceding the period when the rain was falling." As high as 93.25 parts per million of chlorine in the rain water was found on one occasion at Perth with a landward movement of wind of 1,032 miles in 24 hours.

Establishing snow courses and making snow surveys, G. D. Clyde (*Utah Sta. Circ. 91 (1930), pp. 16, figs. 7*).—Attention is called to the fact that "snow surveys are now being made on the principal watersheds of Utah, California, and Nevada, as well as in parts of Idaho, Oregon, and Washington. These surveys form the basis of water-supply forecasts which are made annually at the beginning of the run-off period." The methods and equipment used in making such surveys are described, especially those developed and used by the author in surveys of snow cover in Utah. Particular emphasis is placed upon the importance of properly selecting and establishing snow courses and maintaining continuous records.

Fire weather and fire climate, G. W. Alexander (*U. S. Mo. Weather Rev., 58 (1930), No. 9, pp. 370–372*).—This article defines and discusses the essential elements of forest fire hazards with a view to securing such standardization of observations on precipitation, relative humidity, wind, and lightning as "will allow of comparison of the basic elements of the natural fire hazard over different regions as readily as a comparison of the general climate may be made at present."

Climatology of the Virginias, E. R. Casto (*U. S. Mo. Weather Rev., 58 (1930), No. 9, pp. 374, 375*).—This is the author's abstract of a thesis presented for the doctor's degree at Clark University, which deals in some detail with the various climatic factors of the region, especially as influenced by the diversified topography, proximity to the ocean, and divergent winds.

Monthly Weather Review, [September–October, 1930] (*U. S. Mo. Weather Rev., 58 (1930), Nos. 9, pp. 351–391, pls. 15, figs. 18; 10, pp. 393–438, pls. 14, figs. 14*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for September and October, 1930, solar and aerological observations, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 9.—The Great Drought of 1930 in the United States, by A. J. Henry (pp. 351–354) (see p. 515); Weather Conditions as Factors in the Filtration of the Water Supply at Detroit, Mich. (illus.), by B. Hudgins (pp. 354–362); The Santo Domingo Hurricane of September 1 to 5, 1930 (illus.), by F. E.

Hartwell (pp. 362–364); Hailstorm of September 7, 1930, Across Extreme Southeastern South Dakota and Northwestern Iowa (illus.), by G. K. Greening (p. 365); Some 1929 Fire-Weather Comparisons (illus.), by E. M. Keyser (pp. 365–368); Disastrous Fire Weather of September, 1929 (illus.), by C. I. Dague (pp. 368–370); Fire Weather and Fire Climate, by G. W. Alexander (pp. 370–372) (see p. 516); and Relative Humidity and Short-Period Fluctuations in the Moisture Content of Certain Forest Fuels, by A. G. Simson (pp. 373, 374).

No. 10.—Excerpts from the Annual Report of the Chief of the Weather Bureau for the Year Ending June 30, 1930 (illus.), by C. F. Marvin (pp. 393–396); The Great Drought of 1930 in the United States—Supplemental Notes (illus.), by A. J. Henry, H. B. Humphrey, and B. C. Kadel (pp. 396–401) (see p. 515); Drought in Ohio Valley and Water Supply, by W. C. Devereaux (p. 401); Low Water in the Kentucky River, 1930 (illus.), by W. S. Winn (pp. 401, 402); Squall Lines in New Mexico (illus.), by C. Hallenbeck (pp. 402–405); Late Tertiary Climatic Changes in Oregon (illus.), by E. T. Hodge (pp. 405–411); Meteorological Investigations in Greenland during 1930–31, by L. R. Schneider (p. 412); Swedish Expedition to the North Atlantic Gulf Stream, by L. R. Schneider (p. 413); Meteorological Peculiarities of the Yakima Valley, Washington, by E. H. Jones (pp. 413, 414); The Passing of the Mirage Locally, by A. A. Justice (pp. 414–416); Simplified Rain-Intensity Formulas (illus.), by C. E. Grunsky (pp. 416–418); and Analysis of the Precipitations of Rain and Snow, during 1929–30, at Mount Vernon, Iowa, by W. C. Stewart (pp. 418, 419).

SOILS—FERTILIZERS

[Soil Survey Reports, 1926 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1926, Nos. 21, pp. 47, fig. 1, map 1; 22, pp. 34, fig. 1, map 1*).—These surveys were carried out with the respective cooperation of the Tennessee Department of Education, Division of Geology, and the North Carolina Department of Agriculture and Experiment Station.

No. 21. *Soil survey of Hardin County, Tenn.*, W. J. Latimer et al.—Hardin County has an area of 376,960 acres in southwest Tennessee. The topography is indicated in the statements that "the highland rim is a severely dissected plateau which slopes gently westward;" that "the intervening ridges have fairly steep sides and are narrow and of a hogback relief along the river valley edge but have comparatively flat tops in the eastern and southeastern parts of the county;" and that "the coastal plain represents a dissected plateau" of which "the terraces are badly eroded although many extensive level areas are still intact." Drainage is stated to have been found adequate with the exception of small swales in the bottoms and level poorly drained areas on the terraces.

Guin fine sandy loam, of which it is stated that "the agricultural value . . . is very low," and that "the cleared areas have suffered severely from erosion," constitutes 16.2 per cent of the county, Savannah silt loam 12.7, Baxter gravelly loam 11.5, and Cuthbert very fine sandy loam 11.2 per cent. In all, 30 types of 22 series are mapped and described, together with 0.1 per cent of river wash and 0.6 per cent of rough stony land.

No. 22. *Soil survey of Burke County, North Carolina*, W. D. Lee and S. R. Bacon.—Burke County is an area of 321,920 acres in western North Carolina. "The relief ranges from gently rolling on the piedmont plateau to rugged and precipitous in the mountains. Drainage is generally excessive."

The soils consist of 10 series, including 18 types. Cecil clay loam, of which "on the more strongly rolling areas the run-off is excessive, resulting in serious erosion," constitutes 35.5 per cent of Burke County, and Madison sandy clay loam, subject under the conditions noted with respect to the first-named type to excessive run-off and serious erosion, follows with 12.5 per cent. Talladega stony loam constitutes 11.9 per cent of the county. Unclassified material found includes rock outcrop 0.5 per cent, meadow 0.8, and rough stony land 7.6 per cent of the area surveyed.

A comparison of the Robinson, International, and Bouyoucos methods of mechanical analysis on nonorganic soils, and the analysis of such soil with and without preliminary treatment with hydrogen peroxide, J. H. Dennett (*Malayan Agr. Jour., 16 (1928), No. 11, pp. 374–377*).—The following are among the findings recorded:

The International method was found interchangeable with the Robinson method, from which the same results may be readily obtained by interpolation of the summation curves. As a matter of convenience it was found as accurate to determine the clay fraction at the end of 24 hours at a depth of 30 cm. by the International method as at the end of 8 hours at a depth of 10 cm. It was found unnecessary to use hydrogen peroxide for preliminary treatment of nonorganic soils. The method of Bouyoucos (E. S. R., 57, p. 710) was considered of great utility for routine purposes for determining the general limits of the soil concerned. It appeared that the total sand would be more accurately determined by direct sedimentation, in this latter method, rather than by difference.

A new method of dispersing soils for mechanical analysis, A. N. Puri (*India Dept. Agr. Mem., Chem. Ser., 10 (1929), No. 8, pp. 209–220, fig. 1*).—The theory and details of the following method are described.

"Ten to 20 gm. of soil are left with 100 to 200 cc. of normal NaCl solution for about half an hour with occasional stirring. The suspension is then filtered and washed with about 500 cc. of the same solution on the filter paper. It is finally washed with about 100 cc. of N/10 NaCl solution, and when the whole of it has been drained off about 10 cc. of water is gently poured on the soil which has been brought to the bottom of the filter paper. This displaces the major portion of NaCl. The suspension is then transferred to a stout beaker with 300 to 500 cc. of water. N/10 NaOH is then gradually run in till the suspension is just alkaline to phenolphthalein (used as an external indicator) and mechanically shaken for 1 hour or left for 5 to 6 hours with occasional hand shaking, when it is ready for making up to the desired volume for the pipette method."

For washing the soils the author found Buchner funnels of 3- to 4-in. diameter very satisfactory. "For this purpose it is convenient to stick the filter paper with a little molten wax run round the edges after first moistening the paper with water and applying suction. In this way the whole of the suspension (100 to 200 cc.) can be poured in without any risk of the filter paper lifting up. Practically no soil particles enter the pores of the filter paper if the latter is of fine texture like Watman 50; and when washing is complete, the whole of the soil can be transferred into the shaking bottle with a jet of water.

"It is not necessary to use pure NaCl for replacement. Most of the analyses recorded above were done with a sample prepared from ordinary rock salt after precipitating the bulk of Ca and Mg salts by Na_2CO_3; the excess of the latter was just neutralized with HCl after filtration. The resulting salt contained about 0.1 per cent Ca and Mg salts; these did not affect the results of mechanical analysis."

A new dispersion apparatus for the mechanical analysis of soils [trans. title], J. GOLLAN (*Ann. Sci. Agron. Franç. et Étrang.*, 47 (1930), No. 2, pp. 142–158, figs. 5).—A description and illustration of an apparatus said to give results practically the same as those obtained with the Kopecky device are here presented with some experimental detail. Advantages of the new apparatus over previously described arrangements for such purposes, as claimed by the devisers of the present set-up are (1) easier and cheaper construction; (2) smaller size, permitting the setting up of a battery of apparatus in a limited space; (3) more exact regulation; and (4) avoidance of the necessity for taking down the apparatus to remove the particles of the last fraction determined.

In comparison with the sedimentation method, the results with the new apparatus were found practically identical in the cases of all soils which contained only a limited proportion of the coarser particles. For soils containing a large proportion of the coarser materials the levigation apparatus is said to have been more satisfactory and practically equal in rapidity. The pretreatment advised by the International Commission was found superior to that of Kopecky in that it yields a good dispersion of the colloidal material and is effective in the separation of all the other fractions with the sediment obtained in the first operation without regard to the nature, even if highly calcareous, of the water used. It is considered finally that by making the apparatus of suitable dimensions it would be made possible to use it in the separation of mineral species in petrographic analysis and for separating the constituent particles of various powdered materials such as cements, fertilizers, etc.

On soil acidity, with special reference to the electrolyte content of soil suspensions [trans. title], A. TERÄSVUORI ([*Finland*] *Valtion Maatalouskoetoiminnan Julkaisuja No. 29* (1930), pp. 214, figs. 13).—The paper is a presentation of the author's extensive experimental work and theoretical analyses, comparable in volume and detail of treatment to a small monograph. It is divided into the five main sections: (1) An introduction, in which are discussed the two concepts, the pH value of soil, and soil acidity; (2) some experiments on the dependence of the pH of the soil suspension upon the electrolyte content and on the influence of certain external factors upon the acidity of the soil; (3) the nature of soil acidity; (4) the nature of the "hydrolytic acidity" of the soil; and (5) a rather full summary, covering both the experimental facts and the theoretical considerations developed in the main text.

Soil pH values were found to show wide variation with the methods employed in determining them. Where pH values of different soils or pH values of the same soil at different times are to be compared, it is stated, or the effect of different procedures is to be determined, the prime condition must be the use of absolutely the same method throughout in the pH measurements. Even this precaution was found inadequate where acidity of various soils was to be compared, or the effect of different procedures on the acidity of a single soil was to be investigated. In the last-named case it was found necessary to take into consideration also the electrolyte content of the soil suspension or extract, together with any changes which may possibly have taken place.

With respect to external factors investigated as possibly affecting the acidity of soil samples, the following are noted among other observations. In general, holding soil samples in the air-dry condition had no appreciable effect, either upon their acidity or upon their content of easily soluble electrolytes. A few exceptions, however, in which the acidity was always increased, showed that such changes are possible. Drying the samples lowered in some cases and in others raised the pH value, but the variations were at the most insignificant,

amounting but rarely to more than 0.2 pH. Drying in many cases increased and in many cases decreased the electrolyte content, the electrolyte content usually rising with decreasing pH value and vice versa.

In the case of soils having a large content of ferrous iron or other strongly reducing substances, it was found that the difference in pH value between the fresh and the dried soil samples might be an important one. This difference, however, is attributed to high results found to be obtained in the case of fresh samples.

Lysimeter experiments.—III, Records for tanks 3 to 12 during the years 1910 to 1924, inclusive, T. L. Lyon, J. A. Bizzell, B. D. Wilson, and E. W. Leland (*New York Cornell Sta. Mem. 134* (*1930*), *pp.* 72.)—The present report, covering the years 1910–1924, continues earlier accounts (E. S. R., 39, p. 517; 46, p. 210). The topics here considered include the lysimeters and their treatment; plant growth in the lysimeters; the quantity and rate of the percolation; the removal of nitrogen by drainage water, by plants, and by plants and drainage combined: the removal of calcium, magnesium, potassium, sulfur, and phosphorus; and the effect of various treatments and other influences upon the rate of disappearance of these elements and various other information obtained. The soil used was a Dunkirk silty clay loam taken from the field in layers 1 ft. in depth and placed in the tanks, each of which contained 3.5 tons, in the order in which the layers occurred in the field.

In the cases of nonleguminous crops liming was without effect on the nitrogen content either of the crop or of the drainage waters. Under leguminous crops, on the other hand, liming brought about a decided increase both in crop nitrogen and in the nitrogen content of the drainage waters.

"The quantity of calcium in the drainage water of the unplanted soil was greater than that in the combined crops and drainage water from the planted tanks. Because of this, an annual conservation of 144 lbs. of calcium per acre was effected by cropping the soil instead of leaving it bare. The larger removal of calcium in the drainage water from the unplanted soil than from the planted tanks was apparently due in large measure to the much greater quantity of nitrates leached from the unplanted soil. Bicarbonates and sulfates, also, were probably somewhat concerned since both of these anions were removed in appreciably larger quantities by the drainage water from the bare soil.

"Liming the soil was not accompanied by an increase in the quantity of calcium in the drainage water or in that of the crops produced. Its loss was decreased by cropping. To replace the yearly loss of calcium from an acre of cropped land would require about 560 lbs. of limestone. To recoup the loss from bare soil would require about 900 lbs. of limestone. The quantity of calcium in drainage water was considerably greater where sulfate of potash was applied to the soil than where it was not.

"Magnesium was found in much smaller quantity in both the plants and the drainage water than was calcium. Like calcium its loss was decreased by cropping. Application of lime resulted in a liberation of magnesium, as indicated by its greater removal in the drainage water. Application of sulfate of potash also increased the quantity of magnesium in the drainage water.

"Potassium was removed in smaller quantity by the drainage water than by crops, in which respect it differed from calcium and magnesium. Liming did not increase the quantity of potassium contained in the drainage water or crops. Applications of sulfate of potash did not result in a larger removal of potassium in the drainage water or in the crops.

"The removal of sulfur in drainage water was much larger than in the crops. There was about as much carried off by the drainage water from the unplanted soil as by both drainage water and crops from the planted soil. Liming apparently produced a slight increase in the quantity of sulfur in the drainage water. Of the sulfur added to the soil in the form of sulfate of potash, more than half was removed in the drainage water.

"There has never been more than a trace of phosphorus in the drainage water of any of these tanks. There was somewhat more phosphorus in the crops from the limed tanks than in those from the tanks not limed."

Researches on the suction force of soils and on subterranean irrigation [trans. title], J. BORDAS and G. MATHIEU (*Ann. Sci. Agron. Franç. et Étrang., 47 (1930), No. 2, pp. 192–235, pls. 8, figs. 16*).—The work indicated is taken up in a report of three sections of which the first, the suction force of soil for water and its measurement, takes up (1) the Korneff apparatus, of which a short description is given and is followed by an account of the manner in which the apparatus was used in the present experiments and of the observations made; and (2) the authors' own apparatus, which is described in some detail, together with its mode of operation; and a comparative discussion of all the results thus far noted. Section 2 takes up the utilization of the suction force of soils for the subterranean watering of plants and has the two main subheads of discontinuous and continuous procedures; and section 3 deals first with the results of practical trials carried out in the years 1927–1929 at Avignon and second with the application of continuous subterranean irrigation.

General conclusions especially emphasized are the following: (1) Subterranean watering is the most reasonable method and in practice improves crop yields considerably. (2) It is possible by means of such apparatus as is here described to obtain an exact and rapid measure of the suction force of the soil with respect to water and to determine thereby the optimum humidity for the soil.

It is considered, however, that the practice of subterranean irrigation opens an enormous field for further investigation; and an outline plan of some such further work is indicated.

Soil nitrogen income from rain water, H. H. FINNELL and H. W. HOUGHTON (*[Oklahoma] Panhandle Sta., Panhandle Bul. 23 (1931), pp. 7–24, figs. 6*).—The amount of the nitrate nitrogen per acre received in the rainfall at Goodwell, Okla., was recorded in the years 1925 and 1930 and compared with that observed by other investigators at various points in the United States, Canada, Alaska, and European countries. In general the Oklahoma observations gave values lower than those noted at the points mentioned.

"The small nitrate nitrogen income from rain water appears to vary with the number of rains annually and with the intensity of electrical discharge accompanying the rain." Graphs showing the effect on the nitrate content of the rainfall per acre in single rains of electrical disturbances, ranging from none through mild and medium to severe, indicate the severe disturbances as having been accompanied by nitrate residues about 10 times those determined when the rain fell without electrical disturbance.

Dust was found not to affect the nitrate figures, but did markedly increase the ammonia nitrogen content of the rainfall.

It was further noted that during the period of the ammonia observations the ammonia nitrogen amounted to more than 10 times the nitrate nitrogen.

The direct isolation of Rhizobia from soil, O. N. ALLEN and I. L. BALDWIN (*Jour. Amer. Soc. Agron., 23 (1931), No. 1, pp. 28–31*).—The method described

below is a form employed by the Wisconsin Experiment Station of a method attributed to Budinov.

"Capillary tubes of approximately 1 mm. diameter and 50 to 60 mm. in length were sealed at one end and autoclaved in a dish of the medium. These tubes, filled with the sterile medium, were then suspended through corks with the open end down in a water suspension (1–100) of the soil to be examined. The contents of one of these tubes were plated after one hour and others after 12 and 24 hours on bromothymol blue, yeast-extract, mannitol agar. The plates poured from the 12-hour capillary tubes showed the largest percentage of colonies resembling cultures of Rhizobia, frequently as high as 90 per cent. Such colonies were picked and streaked upon differential media, bromothymol blue, yeast-extract, mannitol agar; Congo red, yeast-extract, mannitol agar; litmus milk; and potato slopes. Provisional identification as to the cross-inoculation group was made from the cultural characteristics. The cultures were then tested for ability to form nodules."

The results are briefly discussed, and it is noted that "the method is an interesting application of the principle of chemotaxis and provides a simple method of securing Rhizobia from the soil without passage through the host plant."

Nitrogen fixation by Rhizobium meliloti and R. japonicum, G. G. Pohlman (*Jour. Amer. Soc. Agron., 23 (1931), No. 1, pp. 22–27*).—It is the conclusion of the author of this contribution from the Iowa State College that "although the results reported here are largely negative, they do not prove that species of Rhizobium do not have the power to fix atmospheric nitrogen in the absence of the host plant. They only show that the proper conditions for the fixation of nitrogen were not provided. On the other hand, the fact that these bacteria are necessary in the legume plant for the fixation of atmospheric nitrogen does not prove that they alone are responsible for the fixation, but does indicate that they play some part in the process. It does seem probable, however, that certain species of Rhizobium may be able to fix appreciable quantities of nitrogen if they are cultivated under the proper conditions."

The chemical composition of New York soils, J. A. Bizzell (*New York Cornell Sta. Bul. 513 (1930), pp. 25, figs. 3*).—A chemical examination was made of 101 soils and subsoils, representative of 85 per cent of the surveyed area of New York State. The New York soils were found in general to have a medium to high nitrogen, phosphorus, and sulfur content; many were relatively low in calcium; and most were found to have a medium to high magnesium and potassium content.

The total calcium content appeared to be "a distinctive characteristic of a soil type," whereas the content of nitrogen, phosphorus, sulfur, potassium, and magnesium showed more relation to texture and little to type, tending to increase with an increasing fineness of the soil.

Nitrogen and sulfur were higher in surface soils and potassium and magnesium lower than in the subsoils, while the relative phosphorus and calcium contents varied with the type.

Chemical researches on podsolized soils and their improvement, S. Nikolitch (*Recherches Chimiques sur les Sols Podzolisés.—Leur Amélioration. Thesis, Univ. Toulouse, 1930, pp. 80, figs. 10*).—This thesis is in two parts, of which the first takes up the solubilization of iron and the formation of the ferruginous deposit, the mechanical carrying down of the clay, and the chemical modification of the clay, while the second discusses the topics of improvement of podsolized soils, an attempt to restore the clay by attaching or synthesizing silicic radicals, and an attempt to modify the clay by the action of heat.

The leaching of iron in podsolized soils appeared to be due to the formation of organic iron compounds, the ferrous and ferric humates playing only a minor rôle in the process. The oxidability of the organic matter acquired as a result of the presence of the iron facilitates the formation of the ferruginous deposits in the deep layers of the soil. The mechanism of podsolization was found not to be limited to the leaching of the iron but to involve also a washing down of clay, together with such modifications in the nature of the clay as removal of exchangeable bases (noted principally in the first and second soil layers), and a lessening of the total exchangeable base capacity (mostly in the second and third soil layers).

In connection with the study of the improvement of podsolized soils it is pointed out that the current practice of liming, though it obviously interferes with the continuation of the podsolization process, does not bring about the restoration of the clay. Deep plowing, with a returning of the deep layers to the surface, was found to bring back into the upper soil certain elements of some importance, especially manganese. This procedure is credited also with increasing the proportion of clay in the upper layers, but did not improve the quality, especially the base exchange capacity, of the clay.

Improvement in base exchange capacity was secured, however, by the use of the alkali silicates, which were found to cause a fixation upon the clay of water-insoluble silicic radicals. This treatment, coupled with suitable fertilizer applications—the clay of the podsolized soils having been found almost devoid of replaceable bases—is presented as a means of definite improvement of podsolized soils, though immediate results are not to be expected on account of nearly complete exhaustion of the natural replaceable bases.

Calcination of the soil surface, said to be very generally practiced in some areas of podsolized soils, was found to have only an unfavorable effect on the clay from the chemical point of view. Any temporary improvement is considered a result principally of the ashes left on the soil, an effect which masks for a short time the unfavorable effect of the calcination (écobuage) itself.

It is considered illogical to speak of podsols as a special type of soil, since podsolization may occur wherever certain conditions prevail. These conditions are principally the presence or formation of an acid humus in combination with a favorable permeability.

Response of Illinois soils to systems of soil treatment, F. C. BAUER (*Illinois Sta. Bul. 362 (1930), pp. 435–514c, figs. 20*).—The subject of this bulletin is taken up in the three parts (1) comparison of Illinois soils in their response to soil treatment, (2) management practices for Illinois soils, and (3) important guiding principles in soil management. A study of experimental field work and related trials "indicates that in planning effective systems of soil treatment and management for any particular soil due attention must be given to the proper balancing of the following factors: Adequate drainage, proper tillage, adjustment of soil reaction with limestone when necessary, establishment of balanced crop rotations, regular replenishment of active organic matter, purchase and application of mineral plant-food elements to supply deficiencies."

Suggestions as to ways in which the above factors may be taken into consideration in the management of each of the 10 groups of soils discussed in this bulletin are given in part 2, where results from different systems of treatment and management on 28 Illinois experiment fields are analyzed and summarized.

Soil and field crop management for Chenango County, New York, A. F. GUSTAFSON, H. O. BUCKMAN, and H. P. COOPER (*New York Cornell Sta. Bul. 514 (1930), pp. 82, figs. 21, map 1*).—From the viewpoint of soil information the

principal contents of the bulletin are included under the headings, topographic features; the soils of Chenango County, including the origin of Chenango County soils and soil-area classification for Chenango County; soil areas and their agricultural characteristics; soil-fertility suggestions for Chenango County, under which are included farm manure, its value, conservation, and use, the lime needs of Chenango County soils, fertilizers for Chenango County crops, and plowing for field crops; and the management and fertilization of rotations; an appendix containing a key to Chenango County soils, in which is indicated also the acreage of the soil types of Chenango County; and a colored soil map of the county.

The bulletin contains also a considerable section (pp. 59–80) on the management of field crops in Chenango County. The last-named section takes up a considerable number of individual crops with specific detail of their treatment on these soils.

An experiment with urea in tea fields, E. C. Marsh-Smith (*Trop. Agr. [Ceylon], 75 (1930), No. 1, p. 10*).—Later records of an experiment, already noted (E. S. R., 62, p. 842), on urea as a tea field fertilizer are here given. "The total increases in average growth have been control 9½ in. to 22¼ in. to date, urea treated plants 9 in. to 24⅓ in. to date. All the plats now show a very healthy appearance, and growth in them is well above the average for the estate."

The solvent action of carbon dioxide on phosphoric acid in agricultural soils [trans. title], A. T. Schloesing and D. Leroux (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 17, pp. 989–991*).—The experimental work described consisted essentially in the treatment of mixtures of ground rock phosphate and calcareous and other soils with boiled distilled water with and without the addition of various quantities of carbon dioxide. The results were found to accord fully with the field observation that natural phosphates, when applied as fertilizers, are effective in acid or humiferous soils but produce in general much less effect or none at all when applied to calcareous soils.

A bacteriological method permitting the determination of the degree of availability of phosphates [trans. title], G. Truffaut and N. Bezssonoff (*Sci. Sol [Truffaut], 7 (1928), No. 1, pp. 3–38, figs. 2*).—Essentially, the procedure described consists in the inoculation of a suitable culture medium containing the phosphate sample to be tested with the three nitrogen-fixing forms *Clostridium pastorianum* (anaerobic), *Bacillus truffauti* (a facultative anaerobe), and *Azotobacter agile* (an aerobic form), and determining, as the index of the biological value of the phosphate tested, the number of milligrams of atmospheric nitrogen fixed in a specified incubation period, the phosphate tested being the sole source of phosphorus for the growth of the culture.

Specifically, the sample is to consist of such a quantity of the material tested as will contain 0.4 gm. of phosphoric anhydride for each liter of the culture medium; and the medium is to contain 10 gm. of glucose as the source of energy and 2 mg. of nitrogen in the form of egg albumin in each liter, together with an excess of calcium carbonate. An incubation period of 21 days is specified. It is considered that the simultaneous starting of comparative series of cultures is assured by the addition of the egg albumin to the culture medium and the use of inocula from fresh, vigorous cultures.

Of the results it is stated that the practical agricultural value of the indications given by the procedure has been established by comparison with the results of field experiments. The last-named procedure is set down as the only decisive test of the actual value of any such method as that here reported.

Activated phosphate.—A new economical phosphatic fertilizer, partially soluble in water and in citrate solution [trans. title], G. Truffaut and N. Bezssonoff (*Sci. Sol* [*Truffaut*], *7* (*1928*), *No. 1, pp. 39–66, figs. 4*).—The process of preparation here proposed consists in principle in the treatment of phosphate rock, preferably finely ground, with sulfuric or other mineral acid, in a quantity just sufficient to insure the decomposition of the fluorides, silicates, and carbonates, leaving the phosphate free to be acted upon by the carbonic and other weak organic acids of the soil. The slowness of the decomposition of untreated ground phosphate rock in the soil is thought to be due in considerable part to the protective mechanical action of the fluoride content and the extremely low solubility of the fluoride-triphosphate complex.

The field results and the availability as indicated by the method detailed in the preceding paper are stated in support of the claims made for the product called neutral or activated phosphate. A brief statement of agronomic conclusions completes the report proper. An appendix includes three patents.

Increasing the profits from phosphates for Tennessee soils, C. A. Mooers (*Tennessee Sta. Circ. 34* (*1931*), *pp. 4*).—Noting that about two-thirds of the total acreage of improved land in the State responds profitably to phosphates, the author proceeds to an account of a comparison of phosphates with and without liming, from which are drawn the conclusions that "although equal parts of ground limestone and acid phosphate would be expected to give good returns, a larger proportion is advised—say two or even three times as much of the limestone as of the acid phosphate," and that rock phosphate increases corn yields in unlimed land more than does superphosphate; and to a discussion of ground limestone and fertilizer mixtures, the new (high-analysis) phosphates, experiments with truck crops, and the choice of limestone.

Of the high-grade phosphates it is stated that "there seems to be only one important drawback to them, so far as Tennessee soils are concerned, and that is that they carry little or no lime in any form. It is doubly important, therefore, to mix them with ground limestone. The station has made careful laboratory studies of such a mixture, and finds that no appreciable loss of ammonia or harmful chemical reaction takes place. The mixture keeps well when exposed to the air; the admixed limestone preventing the absorption of moisture, which would otherwise slowly take place, and to a detrimental extent, unless the fertilizers were kept in the oil-paper containers or tight casks in which they are shipped."

Survey of the fertilizer industry, P. E. Howard (*U. S. Dept. Agr. Circ. 129* (*1931*), *pp. 23*).—Following a very brief historical sketch, the circular outlines first the world industry under the subheads, location of consumption, materials produced, summary of values, world inorganic nitrogen production, world phosphate fertilizer production, and world potash production, and, second, the fertilizer industry in the United States, taking up production and consumption statistics, progress since 1914, location of production and consumption, imports and exports, some values involved, potash supply, phosphate supply, and nitrogen supply.

With respect to commercial fertilizers in the United States, it is noted that "although the total tonnage increase of commercial fertilizer from 1914 to 1928 amounted to only 6 per cent, there was an increase of about 100 per cent in total nitrogen content, an increase of some 16 per cent in total potash, and 40 per cent increase in phosphoric acid, . . . [and that] the total plant-food content increased 45 per cent from 1914 to 1928."

Commercial fertilizers, 1930, J. M. Bartlett (*Maine Sta. Off. Insp. 137* (*1930*), *pp. 37–64*).—In addition to the tabular statement of the usual control analyses, this publication contains an account of a very finely ground rock

phosphate marketed as colloidal and giving, as sold and used in Maine, somewhat variable results. "Not enough experiments have been made to draw any conclusions, and for the present we believe the material should be used only in an experimental way."

AGRICULTURAL BOTANY

Plant ecology, J. E. WEAVER and F. E. CLEMENTS (*New York and London: McGraw-Hill Book Co., 1929, pp. XX+520, pl. 1, figs. 262*).—"This volume is designed to meet the need for a comprehensive textbook of plant ecology and to furnish a guide to workers in related fields. It is written from the standpoint of development, instrumentation, and experiment. . . . It is the outgrowth of many years of research and teaching by both authors, and comprehends the general course in ecology given by the first-named author in the University of Nebraska. . . .

"The experiments and exercises for greenhouse and laboratory have been outlined in detail as an outcome of repeated use by classes. More experimental work has been included than the average class will find time to do, and thus a choice of materials may be had to fit the time and conditions under which the course is given. Field studies have been suggested only in broader outlines."

Relations between acidity and plant growth [trans. title], E. MORGENROTH (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 1 (1929), No. 2, pp. 434–470*).—Manuring exerted a distinct influence upon the acidity of soils. The changes of acidity in soil having vegetable mold appear to bear a close relation to weather and to subsoil. At high acidities, relations between degree of acidity and plant growth were apparent.

Water economy in agricultural plants [trans. title], A. ABLAND (*Wiss. Arch. Landw., Abt. A, Pflanzenbau, 1 (1929), No. 1, pp. 1–160, figs. 51*).—This account deals at some length with water uptake, very briefly with conduction, and elaborately with transpiration in agricultural plants from the standpoint of critical experimentation, giving data and conclusions in detail with an extensive bibliography.

The cultural differentiation of *B. radiobacter* (Beij.) and closely related organisms, H. E. SAGEN, W. H. WRIGHT, and A. J. RICKER (*Jour. Bact., 17 (1929), No. 1, pp. 22, 23*).—On account of the marked similarity of the cultural and morphological characteristics of *Bacillus radiobacter*, *Bacterium tumefaciens*, and many of the legume root nodule bacteria, as well as their occurrence in the same soil and the resulting confusion when their separation was attempted by cultural means, studies of three groups were made. Using single cell cultures of *B. tumefaciens* as a basis for comparison, these studies have shown differences in motility, morphology, absorption of dyes, reduction of nitrates, serological properties, growth in litmus milk, and growth on glycerophosphate media. These differences are set forth, with brief discussion.

The use of asparagus extract in media for the cultivation of legume nodule bacteria, W. R. CARROLL (*Jour. Bact., 17 (1929), No. 1, p. 21*).—A water extract of asparagus was used as a medium for the cultivation of legume nodule bacteria and good results were obtained, the extract comparing favorably with yeast water as an accelerator. Mannitol agar containing a little asparagus extract serves well as test medium for *Bacillus radiobacter* contamination.

Non-reciprocal interchangeability of the Wood's clover and garden bean nodule bacteria, O. H. SEARS and F. M. CLARK (*Jour. Bact., 17 (1929), No. 1, p. 20*).—Detailed studies have proved that the nodule bacteria from legumes in

each of 11 cross-inoculation groups do not produce nodules upon Wood's clover (*Dalea alopecuroides*). Pure cultures of these bacteria produce abundant nodules upon the garden bean (*Phaseolus vulgaris*), and such pure cultures infect Dalea only in case the bean inoculation was produced by Dalea nodule bacteria. Judging by nitrogen fixation, the garden bean culture was more effective upon the garden bean plant than the Dalea culture, even though each culture produced abundant nodule development.

Strain variation in the root nodule bacteria of clover, Rhizobium trifolii, I. L. BALDWIN and E. B. FRED (*Jour. Bact., 17 (1929), No. 1, pp. 17, 18*).—In tests described considerable variation was shown in the benefit derived by the host plant from the bacteria. Three strains described did not increase growth. Conditions indicated partly determine the value of the strains.

Nitrite production by some strains of cowpea and soybean organisms, L. T. LEONARD (*Jour. Bact., 17 (1929), No. 1, p. 19*).—Employing principally soil extract and bean extract liquid media with various nitrates and other compounds as sources of nitrogen, and sucrose, glucose, dextrin, and mannitol as sources of carbohydrate, studies have been made on the production of nitrite, on some members of the cowpea group of organisms and on some strains of soybean bacteria, including both high and low nitrogen-fixing types. As a rule low nitrogen-fixing strains produced greater amounts of nitrite under given conditions than either the cowpea strains or the high nitrogen-fixing strains of the soybean. In some cases nitrite was apparently produced by the low nitrogen-fixing strains from nitrogen compounds other than nitrate, though some cultures of the other two strains caused no perceptible formation of nitrite in any of the media employed.

Isolation of a bacteriolytic principle from the root nodules of red clover, E. R. HITCHNER (*Jour. Bact., 17 (1929), No. 1, pp. 19, 20*).—An agent isolated from red clover root nodules and shown to produce lysis in the strain of red clover bacteria isolated from the same nodules has been carried through 25 serial transfers and filtrations with its homologous organism without loss in activity. The agent is specific for its own homologous strain, giving no lysis of the stock strains of red clover organisms. Lysis of a 24-hour broth culture is complete in two days. If incubation of the lysed culture is continued, secondary growth develops. Bacteria from such secondary growth resist the lytic action of the agent. Though plate counts made from both cultures undergoing lysis showed progressive decrease in bacterial numbers until the period of secondary growth, no complete disappearance of the bacteria was noted. Attempts to produce lysis on solid media by streaking the sensitive organisms and the agent on the surface of plates failed, though subsurface colonies developing in the presence of the agent exhibited a moth-eaten appearance and characteristic lytic areas.

Both the sensitive and the resistant strains showed all the characteristics of the red clover bacteria, and both have been carried through one plant passage, the organisms reisolated proving true to the original type.

The effect of plant passage on certain strains of the root nodule bacteria, O. N. ALLEN and I. L. BALDWIN (*Jour. Bact., 17 (1929), No. 1, pp. 20, 21*).—In this work root nodule bacteria of alfalfa *Rhizobium meliloti* (2 strains), red clover *R. trifolii* (3 strains), pea *R. leguminosarum* (3 strains), and soybean *R. japonicum* (2 strains) were carried through repeated passages in the host plant to study the changes induced in the ability of the microorganisms to benefit the host plants. Pure cultures of *Rhizobium* spp. were used which had been carried in the laboratory on a yeast water mannitol medium for some years without perceptible change. After each plant passage new inoculations

were made from a suspension of a crushed nodule. With each species four plant passages were secured with 2 or more strains.

Work done under carefully guarded and controlled conditions, which are briefly described, showed that with certain strains of the organisms the efficiency was increased by plant passage, while with other strains it was decreased. In general each plant passage within the limits of the investigation increased the effectiveness of the poorer strains of the organism. The luxuriance of growth of the host plant was increased, as were gradually the dry weights of the plants; fewer but larger nodules were formed, and these were located on or near the upper portion of the tap root. Pure cultures of the better strains of root nodule bacteria showed the reverse. Supposedly this decrease in efficiency was due to an increased parasitizing effect rather than to a loss of nitrogen fixing ability. Investigation was started on the question as to whether these induced characteristics are temporary or permanent under the usual laboratory conditions.

Relation between electrophoresis and certain characteristics of the root nodule bacteria, F. Zucker (*Jour. Bact., 17 (1929), No. 1, p. 18*).—Study of the electrophoretic behavior of nodule bacteria with 31 strains of *Rhizobium meliloti*, 18 of *R. trifolii*, and 22 of *R. leguminosarum*, employing the method of Falk, has shown up to the present that a general relationship exists between acid production and electrophoretic velocity. The acid formers show in general a higher velocity than do the nonacid producers, with a dividing point in the neighborhood of 4.2 micra per second. Usually the higher the velocity the poorer the cultures are with respect to their effect on the growth of the higher plant.

The gum produced by the root nodule bacteria of the Leguminosae, E. W. Hopkins, W. H. Peterson, and E. B. Fred (*Jour. Bact., 17 (1929), No. 1, p. 22*).—The strains of heavy gum-producing root nodule bacteria used were *Rhizobium trifolii*, *R. leguminosarum*, and *R. meliloti*. These were grown in pure culture on synthetic media. The bacteria were removed by centrifuging. The gum was precipitated with acetone, dried to constant weight, and ground to an impalpable powder. The analyses included moisture, ash, uronic acid, and pentosans. The uronic acid was determined by the method of Ling and Nanji, and the pentosans by the method of Youngburg. Glucose had previously been identified as a product of hydrolysis of the gum of *R. meliloti*.

Osazones prepared from the sugars resulting from the hydrolysis of the gums of *R. leguminosarum* and *R. trifolii* had melting points identical with the value of glucosazone (204° C.). The fermentation of the hydrolyzed sugar of galactose and nongalactose fermenting yeasts gave identical fermentations, this indicating also that the sugar was glucose. Fermentation of the hydrolyzed gum by arabinose and xylose fermenting strains of lactic acid bacteria failed to indicate a pentose.

A method for the growth of leguminous plants under bacteriologically controlled conditions, E. W. Hopkins, P. W. Wilson, and E. B. Fred (*Jour. Amer. Soc. Agron., 23 (1931), No. 1, pp. 32–40, figs. 3*).—Description is here given in a contribution from the Wisconsin Experiment Station of a seed sterilization method, also of a transfer chamber by means of which planting may be done with much reduced contamination.

"The seeds are sterilized by immersion in vacuo in 1 to 1,000 $HgCl_2$ solution for 5 minutes, and are then treated with a 0.5 per cent sodium hypochlorite solution (modified Dakin's solution). The seeds are sprouted on moist sterile blotters in Petri dishes or planted directly into cotton-plugged bottles containing nutrient salts and agar. The planting is done in a transfer chamber

. . . and a considerable amount of the contamination incident to transferring the seed is thus avoided. At the end of the experiment a test of the sterility of the plant cultures is made by inoculation of the culture medium into litmus milk. Such a bacteriological test of sterility is necessary, as mere observation is insufficient to detect contamination."

GENETICS

Genetics and eugenics, W. E. CASTLE (*Cambridge: Harvard Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1930, 4. ed., rev., pp. X+474, pls. 2, figs. 199*).—This is a revision of the book previously noted (E. S. R., 52, p. 822), involving particularly a more extended account of the knowledge of human heredity and bringing up to date the information on the inheritance of the unit characters of rodents. Other new developments, including polyploidy, parthenogenesis, and the artificial production of mutations, are given special attention.

Light thrown by genetics on evolution and development, C. B. DAVENPORT (*Sci. Mo., 30 (1930), No. 4, pp. 307–314*).—The author defines heredity as the science of the internal factors that direct development. Mutations are continuously occurring, and evolution depends upon the survival of those best adapted to the environment; thus many gametes and zygotes perish at immature stages.

Hybrid vigor in egg-plants and its practical utilization, Y. KAKIZAKI (*Genetics, 16 (1931), No. 1, pp. 1–25, figs. 2*).—A more complete account of experiments previously noted (E. S. R., 63, p. 818).

In most crosses the F_1 seed was heavier than the selfed seed of the mother plant, and there was a small positive correlation between the increase in weight of the F_1 seed and the weight of the seed of the pollen parent. The maximum gain in yield from crossing was 140.8 per cent above that of the higher yielding parent.

Sterility in wild roses and in some species hybrids, E. W. ERLANSON (*Genetics, 16 (1931), No. 1, pp. 75–96, fig. 1*).—An examination at the University of Michigan of pollen of individual rose plants belonging to eight different groups gave a range in mean sterility of from 7.5 per cent in a hexaploid group to 94 per cent in a triploid group. The individuals within each group also exhibited a wide range in percentage of sterility. In examining the progeny of individual wild-rose plants there was noted a wide variation in the percentage of empty pollen grains, thus apparently indicating a high degree of heterozygosity in this genus. With a few exceptions, little variation was recorded in the percentage pollen sterility of different samples taken from the same plant in a given season or between samples taken from the same plant in successive years. Ovule fertility was apparently influenced by the same factors affecting pollen sterility, and in addition by self-sterility, by apomixis, and by environmental conditions affecting the food supply.

Investigation of a gene analysis of men with special reference to the anthropological classification [trans. title], E. FISCHER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 54 (1930), No. 1–2, pp. 127–234*).—Various hereditary characters of color, form, pathology, and psychology in man are described.

The inheritance of blood groups [trans. title], F. BERNSTEIN (*Ztschr. Induktive Abstam. u. Vererbungslehre, 54 (1930), No. 3–4, pp. 400–426*).—From a study of the inheritance of blood groups in man, the author believes that crossover values between the genes *A* and *B* as reported in the literature are mathematically false.

Further investigations on the theory of blood groups [trans. title], F. BERNSTEIN (*Ztschr. Induktive Abstam. u. Vererbungslehre, 56 (1930), No. 2, pp. 233–273, figs. 3*).—An attempt was made to fit various hypotheses to the data on the blood groupings in man reported by different investigators. The goodness of fit was determined by the χ^2 method.

Heredity in live stock, C. WRIEDT (*London: Macmillan & Co., 1930, pp. XI+179, figs. 70*).—The author briefly reviews the principles underlying the inheritance of size, milk production, butterfat content of milk, and hereditary weaknesses, and discusses the influence of inbreeding on cattle, horses, pigs, sheep, and poultry, as well as popular conceptions of breeding in the larger domestic animals.

The gaging of coat color on the basis of the Oswaldian method from investigations with guinea pigs [trans. title], F. KRÖNING (*Ztschr. Induktive Abstam. u. Vererbungslehre, 53 (1930), No. 3–4, pp. 355–367, figs. 4*).—The yellow and black portions of the coat color of guinea pigs have been arranged in a graded series and compared with the findings of Wright (E. S. R., 61, p. 218). General agreement was noted.

Albinism in dogs, K. PEARSON and C. H. USHER (*Biometrika, 21 (1929), Sect. A, No. 1–4, pp. 144–163, pls. 10*).—The results of a study of the inheritance of albinism in dogs are reported, based on records of dog breeding started in 1905. The types of white dogs observed with variations are noted. In general there is considerable correspondence between dogs and mice as regards albinism, but the agreement is not complete. For instance, in mating two albino parents the offspring may have albinotic eyes, but the coat may have in it pale buff or light gray patches. The characteristic albinotic eye of the dog is not entirely free from pigment. Dogs with white coat and dark eyes were also produced.

The genetics of domestic rabbits, W. E. CASTLE (*Cambridge: Harvard Univ. Press, 1930, pp. VI+31, pls. 13*).—The 11 genes for coat color and 1 for fat color are described, together with the multiple allelomorphs of the genes for agouti, color, and extension. The two linkage groups are noted, and the genetic constitution of the various breeds is given. Body size, ear length, and silvers are especially discussed from the inheritance standpoint.

On the series of allelomorphs connected with the production of black pigment in rabbits, R. C. PUNNETT (*Jour. Genetics, 23 (1930), No. 2, pp. 265–274*).—In selected matings the author shows that the genes *D* for dominant black and *J* for Japanese pattern are allelomorphic; that *D'* for steel, *E* for extension, and *J* are allelomorphic; and finally that *D*, *D'*, *E*, *J*, and *e* form an allelomorphic series. In this series *D* and *J* are completely refractory, *E* and *e* nonrefractory, and *D'* partially refractory to the agouti gene *A*.

Genetic and distributional studies of three subspecies of Peromyscus, F. B. SUMNER (*Jour. Genetics, 23 (1930) No. 2, pp. 275–376, pls. 4, figs. 27*).—Species and subspecies of Peromyscus having widely different origins, together with crosses between them, have been studied with reference to the variations in different characters and the relation of the variations to the evolution process.

The multiple factor hypothesis seems necessary to explain the findings regarding the behavior of individual characters in crosses, and on account of the behavior differing only in degree it was impossible to estimate the number of factors involved. A study of the relationship between certain pigmentation characters indicated that this relationship was more probably due to the partial dependence of the related characters upon common genetic factors than because of a direct relationship. It appears that the species differ by more than single mutations, and that either they have been established by selection on the basis

of adaptation or the genetic changes have resulted more directly from the action of the environment. In the subspecies considered, *P. polionotus polionotus*, *P. polionotus albifrons*, and *P. polionotus leucocephalus*, it appears that the selective effect of the environment on the basis of color is most probable, but both methods may work together.

Are "progressive" mutations produced by X-rays? J. T. PATTERSON and H. J. MULLER (*Genetics, 15 (1930), No. 6, pp. 495–577, figs. 3*).—From a study of the influence of X-rays in inducing mutations in a number of experiments with Drosophila, the authors conclude that mutations can be produced by irradiation in both of two opposite directions at the same locus, indicating that all mutational changes by X-rays do not involve losses. Some of the X-ray mutations also appeared to involve an increase in vigor. The results led to the conclusion that the induced point mutations are due to changes in the chemical composition of the genes, and may be of varied kinds which are endless in their eventual potentialities.

Seasonal effects on Mendelian segregations and sex ratios, W. CHRISTIE and C. WRIEDT (*Hereditas, 14 (1930), No. 2, pp. 173–196*).—H. Wexelsen has made a study of data collected by Christie and Wriedt relating to the influence of season on the segregation of Mendelian characters in pigeons, fowls, and peas, and the relation of season to the sex ratios found in pigeons and fowls.

The studies with pigeons were concerned with the *d* factor for dilution of color. In the data collected from 1920 to 1927 it was found that there was an excess of *D* individuals among those born before July 1, but an excess of *d* individuals among those born after July 1. As this is a sex-linked character the sex ratio was altered in the same way, but did not appear to be concerned with season beyond the relation of sex to the *d* factor.

It was also found, in chickens hatched during 1925, 1926, and 1927, that there was an excess of barred offspring at the beginning of the season and an excess of black offspring toward the end of the season, thus paralleling the observations with pigeons. There appeared to be no relationship between the ratio of barred to black and the age of the males and females used for breeding. The sex ratio was also not affected by the season of the year, antecedent egg production, or the age of the female.

In the studies with peas the F_2 segregations of yellow v. green cotyledon and dwarf v. tall varieties were not related to the time at which flowering occurred or the position of the pod.

The experimental determination of sex and sexual sterility by hormones [trans. title], B. PANIZZA (*Arch. Ital. Biol., 83 (1930), No. 2–3, pp. 90–99*).—In this study, 108 female guinea pigs received intraperitoneal grafts of immature or adult testes. The testicular grafts when in larger amounts resulted in sterility or abortion in many cases. There were produced 2.2, 1.5, 1.23, and 2 females, respectively, per male among the offspring.

Compensatory hypertrophy of the testicle [trans. title], M. ALMAGIÀ (*Arch. Ital. Biol., 83 (1930), No. 2–3, pp. 137–143*).—Studies of the influence of semicastration in rats in four series of experiments indicated that there was no compensatory hypertrophy in the remaining testicle. A single testicle was able to carry on the function of the two without hypertrophy.

Ovulation, oestrus, and copulation with consequent dystocia during pregnancy, in the mouse, L. J. WATT (*Science, 73 (1931), No. 1881, pp. 75, 76*).—An account is given of a female mouse which was observed to have some difficulty at parturition. Upon examination the presence of a vaginal plug was found. Histological examination of the ovaries and oviducts showed that ovulation had occurred. One ovary contained eight corpora lutea and the

other contained three, all of which were estimated to be seven hours old. The ova were found in the oviduct. This is cited as a case of ovulation occurring during gestation.

FIELD CROPS

Effect of climate on nitrogen content of maize, barley, and red clover, E. J. Delwiche and W. E. Tottingham (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 681–688*).—Red clover, Chippewa flint corn, and Oderbrucker barley were grown at the experiment station in southern Wisconsin and at Ashland in northern Wisconsin, localities differing markedly in temperature, length of season, precipitation, and number of clear days. The northern-grown clover contained less protein and the corn and barley more protein than the southern-grown crops. However, the test results suggested that hays and grains of the same varieties when cut at the same period of maturity in both northern and southern Wisconsin differ little in feeding value.

The chemical composition of consecutive cuttings of Andropogon virginicus and Danthonia spicata, R. B. Dustman and A. H. Van Landingham (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 719–724, figs. 2*).—In cuttings made at regular monthly intervals in 1929 in continued studies (E. S. R., 62, p. 131) at the West Virginia Experiment Station, the protein, fiber, and mineral contents of *D. spicata* as they normally occurred in early June were maintained throughout the summer and early fall without the usual deterioration in nutritive quality. With *A. virginicus* cutting at monthly intervals did not prevent entirely a decline in protein and a corresponding rise in fiber content, but it reduced materially the tendency toward such changes. The possible application of these results in the utilization of wild pasture grasses and in systems of rotational grazing is suggested.

Alfalfa trials at the North Central Experiment Station, O. I. Bergh (*Minnesota Sta. Bul. 267 (1930), pp. 19, figs. 14*).—Production practices for alfalfa are outlined from variety, liming, inoculation, and seeding experiments for various periods since 1916 and from experience.

Grimm was consistently the most winter hardy of the varieties and led in production. From 8 to 12 lbs. of seed per acre seemed enough with proper conditions. Gopher oats at the rate of 2 bu. per acre or barley at the rate of 1.5 bu. did not appreciably affect the alfalfa stand unfavorably or reduce the yield of hay greatly. Inoculation with soil from a well-established alfalfa field gave better results than inoculation with the bacteria culture currently available in 1916–1918.

Artificial tripping of flowers in alfalfa in relation to seed production, J. W. Carlson (*Jour. Amer. Soc. Agron., 22 (1930), No. 9, pp. 780–786*).—Further studies (E. S. R., 59, p. 826) in 1928 and 1929 on the Alfalfa Seed Farm of the Utah Experiment Station produced results largely in harmony with those of other experimenters. On the average, it appeared, artificial tripping will increase the percentage of flowers forming pods in the ratio of 1:2.5 as compared with natural development. Seed pods formed as a result of artificial tripping were found to attain to normal maturity and to be fully equal to those formed under natural conditions. From the data presented, artificial tripping in alfalfa apparently results in greater stability and regularity in the subsequent behavior of the flowers. When being considered for seed production, untripped flowers seemed to be more easily influenced unfavorably by changes in the external environment of the flower. Since the author's data show that only a relatively small part of the flowers that develop naturally become tripped, either automatically or through the aid of insects, it seems

that in the Uintah Basin alfalfa flowers are capable of setting pods rather freely in the absence of tripping.

Root systems of young corn plants in relation to fertilizer applications, C. E. MILLAR (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 868–873, figs. 2*).—The roots of corn planted by the Michigan Experiment Station in Coloma loamy sand, Granby sandy loam, Conover loam, and Rifle muck showed a general tendency to develop horizontally in the early stages of growth and to remain at comparatively shallow depths. At 6 in. from the plant the average roots of the upper whorl in sandy loam and muck were within 3 in. of the surface, in the loam less than 4 in., and in the sand about 4.5 in. from the surface. As a whole the roots in the lower whorls were little, if any, deeper than those of the upper whorl. At 9 in. from the plant, the roots from both the upper and lower whorls were within 5 in. of the surface in sandy soil and about 3 in. in muck, and the upper roots in sandy loam and loam averaged less than 4 and 5 in., respectively, from the surface. It seemed evident that fertilizer placed on either side of the seed and slightly below it would be in the direct line of growth of the roots, and should therefore be used by the plant earlier than fertilizer placed directly below or above the seed.

Sodium nitrate as a fertilizer for corn on Iowa soils, R. A. PENDLETON (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 673–680*).—Sodium nitrate was applied by the Iowa State College to corn at the rate of 100 lbs. per acre in early, divided, and late applications, with and without superphosphate, in series on 16 fields including 9 different soil types, mainly on the less productive soils of Iowa.

Used without superphosphate the divided application gave slightly the highest yield, 6.2 bu. more per acre than the checks as an average for all fields. The early and the late applications made average increases of 4 and 5 bu. per acre, respectively, over the checks. When superphosphate was used with the nitrate, the yield increase was somewhat less. Clinton silt loam showed the greatest response to nitrates. The fertilizer treatments did not influence materially the nitrogen content of the grain. In a special study there was no evidence that sodium nitrate was of any value as a side dressing for corn on Carrington loam kept in a fairly good state of fertility.

Size of plat and number of replications in field experiments with cotton, L. L. LIGON (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 689–699*).—Field studies to determine the minimum size of plat and number of replications consistent with accuracy for cotton experiments were made in cultural and varietal trials in progress at the Oklahoma Experiment Station during 1925, 1926, and 1927.

Statistical treatment of the yield data from the various groupings by the several sizes of plats suggested that in cotton-field tests where yield is a factor for consideration the rows need not be longer than 100 ft. It appeared possible that shorter rows with an increase in the number of replications might be even more desirable. A three-row plat in which the central row only is used for yield data might serve as well as plats with more rows. Plats of single rows 100 ft. long gave a probable error of 6.05 per cent for one replication in 1925 and probable errors of 6.37 per cent and 5.61 per cent for two replications in 1926 and 1927, respectively. The use of three replications, or four plats, of each variety is suggested. The merits of the 200-ft. and 300-ft. plats are also pointed out.

Cotton variety tests, 1930, H. K. BRABHAM and G. A. HALE (*Georgia Sta. Circ. 90 (1930), pp. 4*).—Variety tests with cotton at the station and near Yates-

ville in the Piedmont and near Waynesboro and Carnegie in the Coastal Plain section are reported for 1930. Among the cottons of merit for wilt-free soils were Stoneville No. 2, Coker Cleveland 884, and D. & P. L. No. 8, and for wilt-infected soil Lightning Express and Super Seven.

Cotton fertilizer experiments, 1930: Sources of nitrogen, supplements, and time and method of application, G. A. Hale (*Georgia Sta. Circ. 91 (1930), pp. 4*).—In complete fertilizers for cotton the phosphorus in ordinary 16 per cent superphosphate and in 43 per cent or triple superphosphate was more efficient than that in diammonium and monoammonium phosphate. Magnesian limestone (400 lbs.) increased yields on all plats. Small applications, 100 to 400 lbs., of magnesian limestone used with ammonium sulfate 150 lbs. in a complete fertilizer gave profitable increases. Both magnesium sulfate and calcium carbonate (calcic limestone) increased cotton yields when added to a concentrated complete fertilizer.

Although peanut and velvet bean meal led the older nitrogen carriers in acre yield, calcium nitrate was a more desirable single source because of lower cost per pound of nitrogen. Of the new carriers those materials containing a combination of calcium and nitrate nitrogen produced the most cotton. Small quantities of cottonseed meal used with sodium nitrate made more cotton than where only sodium nitrate was used.

In tests of time and method of applying nitrogen, ammonium sulfate gave best results in a divided application, and a mixture of sodium nitrate and ammonium sulfate was better than either used alone. The response to potassium on Cecil clay loam was slight, but top-dressing seemed to be somewhat superior to putting all the potassium under the cotton. With complete fertilizer the results indicated that split applications, where large quantities are used, gave greater returns than putting all the plant food under the cotton. Barring off the cotton at chopping to make side applications of fertilizer by hand seemed to reduce yields.

Variability of grain sorghum yields as influenced by size, shape, and number of plats, A. F. Swanson (*Jour. Amer. Soc. Agron., 22 (1930), No. 10, pp. 833–838*).—Data on the influence of size and shape of plats and the number of replications on the variability in the yields of sorghum grain were obtained at the Fort Hays, Kans., Substation during the fall of 1923. In a field of a pure line of Dawn kafir, planted in rows 40 in. apart, a block 50 rows wide and 16 rods long was harvested in single row units 2 rods long, equivalent to about $\frac{1}{400}$ acre.

The reduction in probable error of grain sorghum yields was not great after the plat was increased in size to $\frac{1}{25}$ acre. Long narrow plats seemed the most reliable for varietal trials and the most practical as to economy, and their probable errors were slightly lower than for plats of the same area but more nearly square in shape. When protected by borders, 2- to 4-row plats 8 rods long having an area of from $\frac{1}{50}$ to $\frac{1}{25}$ acre are considered desirable and convenient units. For conditions in the Great Plains it seemed desirable to have from 2 to 4 replications of a variety and to grow the sorghum long enough to sample the seasons.

Influence of soil conditions, fertilizer treatments, and light intensity on growth, chemical composition, and enzymic activities of sugar beets, J. Tyson (*Michigan Sta. Tech. Bul. 108 (1930), pp. 44, figs. 12*).—The influence of certain environmental conditions on the growth, chemical composition, and enzymatic activities of the sugar beet was studied, using material grown on Rifle muck, Hillsdale and Berrien sandy loams, Miami loam, and Brookston silt loam variously fertilized. In the study of light intensity, beets on Hillsdale

sandy loam were grown for different periods under shades admitting several degrees of illumination.

In both leaves and roots of sugar beets the mineral contents appeared to be influenced greatly by soil conditions and fertilizer treatments, whereas the intensity of light presented to the plant appears to be associated more closely with the utilization than with the absorption of the elements. Lack of light apparently did not decrease the ability of the plant to secure mineral nutrients from the soil, as the percentages of these nutrients were inversely proportional to the light intensity.

Certain soil conditions and fertilizer treatments seemed to enable the plant to absorb mineral nutrients in quantities and ratios favorable to growth. The optimum was found on Brookston silt loam receiving sodium nitrate 100 lbs., superphosphate 400 lbs., and potassium chloride 100 lbs. The respective percentages of minerals found in the leaves and roots of sugar beets grown on this soil were potassium, 6.9, 0.9; phosphorus, 3.4, 0.8; nitrogen, 1.7, 0.6; calcium, 1.3, 0.15; and magnesium, 0.9, 0.2 per cent. Whenever the elements occurred in any different order than the foregoing the size of beets produced was smaller. Seasonal fluctuations in mineral nutrient content were found to vary with the soil, the fertilizer treatment, and the stage of growth. Usually the percentages of minerals were highest in the spring, low during the summer, and, if enough minerals were present in the soil, high in the autumn.

The sugar content usually was highest on plats producing the best yields of beets on each soil. When sodium nitrate was applied in large quantities or late in the season, the sugar content was lowered. Application of potassium fertilizer on the soil most deficient in potassium resulted in increased sugar content, although it had little influence on other soils.

Relative sugar content was not influenced by intensity of light until growth was inhibited. Reduction in the intensity of light to a certain point was accompanied by leaf elongation, but thereafter leaf elongation decreased.

Catalase activity was correlated positively with vigor of growth and size of plants, whereas oxidase activity was greater in every case in which the growth of the plant was inhibited. The data indicated a positive correlation between the intensity of light and the activity of catalase and a negative correlation between oxidase activity and light intensity.

Soil fertilization for sugar beets, J. Tyson and M. M. McCool (*Michigan Sta. Spec. Bul. 205 (1930), pp. 31, figs. 9*).—Fertilizer trials with sugar beets on several soil types indicated as most profitable mixtures containing nitrogen, phosphoric acid, and potash in the ratios 1–4–1 and 1–4–2. The greatest returns on most soils came from applications of 4–16–4 or 4–16–8 fertilizer at the rate of 400 to 600 lbs. per acre. Soils more productive and containing more organic matter responded to even larger applications of fertilizer. The results on the individual soil types are set forth in detail.

On soil with plenty of organic matter the benefits from nitrogen application were found to depend largely upon the use of a soluble material in early spring to start the young plants quickly. Sodium nitrate applied before planting was as effective as the same quantity applied in installments.

The residual effect of the fertilizer applied for sugar beets was quite evident in the increased yields of the following crop of oats, especially where large quantities of superphosphate had been applied.

The effects of certain soil conditions on the yield and quality of Burley tobacco, C. A. Mooers (*Tennessee Sta. Circ. 33 (1930), pp. 4*).—A field survey in east Tennessee involving 148 successful growers of Burley tobacco showed that well drained upland soils derived from various rock formations were in general

use but that the land was carefully selected, for only deep, rich, loam soils are well suited to tobacco. Soils derived from high-grade limestones and Tellico sandstone gave the best returns per acre. There was a progressive increase in acre yield and returns as the depth of the surface layer of soil increased, the best returns being from 15 in. and deeper. Nearly seven-eighths of the growers used manure, substantial increases coming from applications averaging 14.4 loads per acre. On the average, fertilizers were used profitably, even up to the heavier applications. The largest yields and the best quality, as judged by the price received per pound, were obtained where red clover was the preceding crop.

The potassium, chlorine, and sulfate content of Kentucky tobacco as related to grade, O. M. Shedd (*Kentucky Sta. Bul. 308 (1930), pp. 445–471*).—A comparative study of the content of potassium, chlorine, and sulfate sulfur in good and common grades of Burley and dark tobacco involved 328 samples selected from the crops of 1920, 1921, and 1924.

Wide variations in certain mineral constituents were determined in the two kinds of tobacco, e. g., the extremes in the Burley were for potassium 0.79 to 7.36 per cent, chlorine 0.02 to 1.5, and sulfate sulfur 0.09 to 0.81 per cent; and for the dark, 0.76 to 4.72, 0.04 to 2.99, and 0.11 to 0.82 per cent, respectively. The good grades surpassed the common in potassium content in 78 per cent of the comparisons of the Burley tobacco and in 62 per cent of the dark tobacco, in chlorine in 58 per cent and in 48 per cent, and in sulfate sulfur in 64 and in 63 per cent, respectively. Combining the three crops, the averages of the good grades of Burley showed 24 per cent more potassium, 31 more chlorine, and 4 per cent more sulfate sulfur than the common, and the averages of good grades of dark tobacco showed 9 per cent more potassium, 20 more chlorine, and 15 per cent more sulfate sulfur than the corresponding common. The Burley tobacco carried 42 per cent more potassium than the dark, whereas the latter had 196 per cent more chlorine and 11 per cent more sulfate sulfur. There was less chlorine than sulfate sulfur in each crop of Burley tobacco. The reverse was true for the three crops of dark tobacco.

More potassium was present in the smoker grades of Burley than in the filler grades. The potassium content of the different grades of both Burley and dark tobacco usually varied in proportion to market quality and price. Of the grades of dark tobacco the most potassium was in the leaf and the least in the trash. Organic potassium predominated in the better grades of Burley, particularly if the medium wrappers were included in these grades where they properly belong. The smoker grades had more organic potassium than the fillers. There was a gradual diminution of potassium content in the Burley and dark crops of tobacco since 1920, and this was pronounced in 1924. There was not always a corresponding diminution, however, in the chlorine and sulfate sulfur, except in the Burley.

That the leaf disease may have affected the content of some of the mineral constituents considerably was indicated by averages showing that the samples of leaf with stem moderately infected with leaf disease had 97 per cent more potassium, 287 per cent more chlorine, and 8 per cent more sulfate sulfur than corresponding samples badly infected. Samples without the stem showed 44 per cent more potassium and 86 per cent more chlorine, and 9 per cent less sulfate sulfur in moderately diseased than in badly diseased tobacco. In the Burley crop of 1920, when the diseased samples were selected, the good grades had 14 per cent more potassium, 171 more chlorine, and 9 per cent less sulfate sulfur than the common, suggesting that possibly these leaf diseases are associated with certain nutritional deficiencies.

Effect of fertilizers on the yield and composition of wheat, H. F. Murphy (*Jour. Amer. Soc. Agron., 22 (1930), No. 9, pp. 765–770, figs. 11*).—The effect of

fertilizers on the quality and yield of winter wheat was studied by the Oklahoma Experiment Station on Kirkland sandy loam. Just after the wheat was seeded, sodium nitrate, superphosphate, and kainite were applied broadcast according to the triangular system in quantities totaling 300 lbs. per acre.

Nitrogen and potassium used singly or in various combinations yielded less than adjacent unfertilized plats, whereas there was a noteworthy response to phosphorus. Phosphorus and potassium combinations gave larger yields than phosphorus and nitrogen or a combination of all three elements. The highest yielding combination was 225 lbs. of superphosphate and 75 lbs. of kainite.

The protein content of the grain rose with increase in nitrogen applied, 150 lbs. of sodium nitrate giving the greatest increase per unit of nitrogen. For 1928 and 1929, wheat receiving the potassium treatment averaged a little below normal (unfertilized), the phosphorus treatment almost 2 per cent below normal, and the nitrogen treatment about 1 per cent above normal in protein content.

Grain from plats receiving 300 lbs. of superphosphate contained the highest percentage of phosphorus, and that from unfertilized soil exceeded grain from plats receiving all three elements. The phosphorus content was higher where potassium alone was supplied than from nitrogen alone.

The plumpest kernels were produced on soil fertilized with kainite and superphosphate in the ratio 1:1, but higher ratios of superphosphate to kainite likewise produced very plump kernels. When nitrogen was used in large quantities the kernels shriveled considerably and were less plump than where no fertilizers were used, although the protein content was higher with these treatments.

Sodium nitrate as a fertilizer for wheat on certain Iowa soils, R. A. Pendleton (*Jour. Amer. Soc. Agron.*, *22* (*1930*), *No. 9, pp. 753–756*).—When sodium nitrate was applied in different quantities as top-dressing to winter wheat on Shelby loam and Waukesha silt loam on either April 10 or at heading, or at both times, in a study at the Iowa State College, the largest increase over the check came from 200 lbs. applied April 10. The later applications were somewhat more efficient than the early treatments in increasing the protein content of the grain and about equal in increasing the yield. The increase in yield produced by the fertilizer was more significant than the increase in protein content. Returns from the use of superphosphate with the sodium nitrate were not appreciable on either soil type.

The relation of organic food reserves to the effect of cutting pasture weeds at different stages of growth, C. O. Grandfield (*Jour. Amer. Soc. Agron.*, *22* (*1930*), *No. 8, pp. 709–713, figs. 2*).—When plats containing three common pasture weeds at the Kansas Experiment Station were cut at intervals between May 26 and October 29, 1928, the survival May 20, 1929, was least with *Verbena stricta* cut June 23 and with *Solidago rigida* cut July 21, both in the bud stage. The least carbohydrates and total nitrogen in the roots of these plants and *Vernonia baldwini* occurred just before the bud stage of development. From the time of budding until the plants were in full bloom organic food reserves evidently were being stored in the roots.

HORTICULTURE

Report of the division of horticulture, W. T. Macoun et al. (*Canada Expt. Farms, Div. Hort. Rpts. 1928, pp. 67, figs. 19; 1929, pp. 72, figs. 15*).—These are the usual annual reports (E. S. R., 60, p. 638).

In the report for 1928, descriptions are presented of various named apple seedlings of Northern Spy parentage originated at the Central Experimental Farm, Ottawa. Preliminary results of a fertilizer test at Abbotsford, Que., with mature apple trees growing in sod were in favor of a complete fertilizer.

A mixture of 4 lbs. of nitrate of soda, 2 lbs. of superphosphate, and 1 lb. of muriate of potash used at the rate of from 8 to 10 lbs. per tree for fully grown trees is recommended. Girth measurements taken on dwarf apple trees growing in sealed pots and treated differently in respect to nutrient supply showed the maximum gains in a lot receiving a complete nutrient solution until July 15 and thereafter no nitrogen, and in a second lot to which no nitrogen was supplied until the pink stage of the flowers but continuously thereafter. The indications were that early spring applications of nitrogen had little influence in promoting growth. The critical period for applying nitrogen in respect to promoting growth was apparently from the middle of June to the middle of July. Applications of nitrogen after September 1 had little effect on growth.

From records taken in 10 years of breeding strawberries there are presented various successful and unsuccessful parental combinations. In the project on the effects of nitrogen, phosphorus, and potash starvation of strawberry plants at different stages of growth, further evidence was obtained in support of the value of autumn fertilization. Plants from which nitrogen was withheld until August 1 made rapid recovery, losing their starved appearance in 2 weeks, whereas potash- and phosphorus-minus plants took longer to recover after restorative treatment. The importance of phosphorus on the set of strawberry blossoms was shown in a set of only 20 per cent when phosphorus was withheld during the flowering season, as compared with 38 per cent where potash was withheld and 54 per cent where nitrogen was lacking.

Breeding work with vegetables included the development of tomatoes for early maturity combined with desirable quality, and resulted in several seedlings of considerable promise. Crosses between the Black Beauty and Black Nagasaki eggplant resulted in seedlings combining the early maturity of the Nagasaki with some of the desirable qualities of the other parent. Melon plants grown under Vitaglass, common glass, and Cel-O-Glass gave an average vine growth of 94, 82.6, and 42 in., respectively. The covering of cucumber plants with protective paper caps resulted in from 3 to 5 days earlier germination, with but little difference in the date of maturity. Paper mulch experiments with tomatoes yielded no evidence in favor of the paper, but it is pointed out that the weather was such as to make the test inconclusive. Breeding work with peas, corn, and cabbage is discussed, and the results of variety tests with various vegetables are presented in tabular form.

Descriptions are presented of named lilac, crab apple, iris, lily, and chrysanthemum seedlings originated at the Central Experimental Farm.

In the report for 1929, descriptions are presented of numerous apple seedlings originated at the Central Experimental Farm. Cultural experiments with apples conducted at Abbotsford, Que., showed the value of a complete fertilizer, the yields being generally higher than from either nitrate of soda or sulfate of ammonia alone and in certain instances higher than a combination of nitrogen and phosphorus. Growth, as measured in girth increment, was greatest in the completely fertilized trees. Nitrate of soda and ammonium sulfate were practically equal in their effects on yield. Sod mulch not only gave larger average yields than did sod but also promoted annual fruiting. Results of pollination studies with various apple varieties presented in tabular form failed to show any lack of compatibility between varieties but marked self-incompatibility. Fameuse was fully self-incompatible, McIntosh gave a small set, and no variety yielded as well as when open pollinated. Fameuse was a shy and Duchess a prolific pollen producer.

In a controlled nutrition study with the Bonny Best tomato a normal solution having a total salt concentration of 0.0525 produced the best growth

and yield. Excess nitrogen decreased growth and yield, stunting the plants and causing lesions to develop on the stems and leaf petioles. In many instances the petioles finally dropped off. Potash apparently lessened the injurious effects of excess nitrogen. A lack of potash resulted in almost no growth and purpling of the under surface of leaves. Lack of phosphorus produced symptoms quite like those of potash starvation.

In pea breeding studies seedlings were secured which produced very small but wrinkled seeds, a desirable situation from the canner's viewpoint. Uniform strains of Golden Acre cabbage were obtained by inbreeding. Paper mulch trials with various vegetables are reported and show promising results with cucumbers and melons. Brief comments are presented on the results of extensive strain tests of vegetables, descriptions are given of various polyantha pompom roses, and data are included on the yields of sweetpea varieties in the greenhouse.

Vegetative propagation of broccoli from heads, R. J. D. Graham and L. B. Stewart (*Bot. Soc. Edinb. Trans. and Proc., 30 (1929–30), pt. 3, pp. 216, 217, pl. 1*).—Pieces of the sterile inflorescence of broccoli with attached scale leaves rooted when placed in a satisfactory environment, thus affording a means of increasing rare breeding stock, etc.

Masters memorial lectures, 1929.—Stock : scion relationships, R. G. Hatton (*Jour. Roy. Hort. Soc., 55 (1930), No. 2, pp. 169–211, pls. 16, figs. 4*).—A comprehensive discussion of the vegetative propagation of deciduous fruit trees, taking into consideration in particular the work of the East Malling Research Station, England.

Investigations on the nutrition of fruit trees: Some effects of deficiencies of nitrogen, potassium, calcium, and magnesium, with special reference to the behaviour of certain varieties of apple trees, M. B. Davis (*Jour. Pomol. and Hort. Sci., 8 (1930), No. 4, pp. 316–344*).—Studies conducted at the Long Ashton Research Station, England, with apple trees grown in sand or sand-soil mixtures and given differential nutritional treatments presented evidence on the function of the various important nutrient elements. The omission of nitrogen resulted in restricted shoot growth, yellowed foliage, and delayed bud expansion in the spring. The omission of potash restricted growth in some cases and increased it in others, caused some premature defoliation with later retention of the remaining leaves, and caused leaf scorch and much earlier bud opening in the spring. Phosphorus omission caused early defoliation, very restricted shoot growth in some cases, a typical bronzing of the foliage, and delayed bud expansion. Calcium omission produced increased shoot growth and larger leaves in the early stages, with breakdown of the leaf tissue in the form of brown patches near the center or along the margins. Magnesium omission was marked by a reduced shoot growth, early defoliation, and a tissue breakdown similar to that induced by the absence of calcium. Some difference was noted in the response of the three varieties, Bramley Seedling, Worcester Pearmain, and Allington Pippin, used in the study. All omission treatments were reflected in the composition of the ash and dry matter of one-year shoots and leaves. A high degree of correlation was found to exist in the percentage composition of certain materials; for example, a highly significant negative correlation between K_2O and CaO, a possibly significant negative correlation between CaO and P_2O_5, and a positive correlation between P_2O_5 and K_2O.

Effect of certain hydrocarbon oils on the transpiration rate of some deciduous tree fruits, V. W. Kelley (*Illinois Sta. Bul. 353 (1930), pp. 579–600*).—Continuing a series of papers on the general subject (E. S. R., 63, p. 536) the author discusses the results of a study of the effect of saturated and unsat-

urated oils on the transpiration rates of apple, pear, plum, peach, and sour cherry leaves. All of the oils retarded transpiration rates in the case of all the species studied, as much as 75 per cent in a few cases. Sprays applied to the upper surface had no effect on transpiration, and spraying both surfaces reduced the rate no more than spraying the under surface alone. Reduction in transpiration rate was greater with older than younger leaves.

Noting that the stomata of oil sprayed leaves did not open as widely as those of unsprayed leaves, the author suggests that oil in some way may reduce the soluble carbohydrates and thereby lessen the turgor of the guard cells. The degree of retardation of transpiration rose with an increase in the concentration of the oil but was evident even at 0.5 per cent, the lowest concentration used. The lack of any constant differences between saturated and unsaturated oils in their influence on transpiration suggests that the harmful effect of the oil is physical rather than chemical. The retarding effect of oil was noted within 30 minutes and continued as long as the experiment lasted (3 days). Differences in stomatal apertures of leaves on the trees were evident 9 days after spraying.

Topworking the apple tree, M. B. Hoffman (*West Virginia Sta. Circ. 57 (1930), pp. 31, figs. 25*).—General information is offered on the principles and practices of top working fruit trees, with particular reference to the apple.

A thumb test for distinguishing Mazzard (Prunus avium L.) and Mahaleb (Prunus mahaleb L.) rootstocks, B. R. Nebel (*Amer. Nat., 65 (1931), No. 696, pp. 95, 96*).—Small pieces of the root of the Mazzard cherry immersed in an aqueous solution of from 4 to 10 per cent of iron alum began to darken the solution in a few minutes, reaching a maximum in from 1 to 48 hours according to the size of the pieces and the amount of solution employed, whereas under the same treatment Mahaleb roots failed to affect the color of the solution in any way.

Sweet and sour cherry yields at Goodwell, Oklahoma, E. P. Eshbaugh (*[Oklahoma] Panhandle Sta., Panhandle Bul. 23 (1931), pp. 3–6, fig. 1*).—Records presented on the yield of various sour and sweet cherry varieties are distinctly in favor of the sour varieties, particularly those of the Montmorency type. Measurements taken of shoot and leaf growth of Montmorency King trees, some mulched with straw and some unmulched, showed the significantly more vigorous growth on the mulched trees.

The effect of ultra-violet light on germination of seeds and growth of seedlings of Ribes rotundifolium Michx., S. B. Detwiler (*Jour. Forestry, 29 (1931), No. 1, pp. 131–133*).—Exposure of dry seeds of *R. rotundifolium* to ultra-violet light of a wave length of 2,700 to 3,200 angstrom units for 5, 10, and 20 minutes prior to planting in sterilized soil proved harmful in every case. The untreated seeds germinated earlier, although no better in greenhouse tests. The visible effect of the ultra-violet light exposure was a pronounced stunting, varying in duration with the length of the treatment. However, after 17 weeks all differences in vigor caused by the light had apparently disappeared.

Propagation studies with the southern blueberry, L. M. Ware (*Mississippi Sta. Bul. 280 (1930), pp. 40, figs. 18*).—Stating that the expansion of the commercial production of improved blueberry varieties is dependent on the development of a successful method of propagation, the results are presented of two years' investigations that show that the blueberry may be successfully propagated from cuttings, provided they are taken at the correct season and properly handled. Cuttings taken at the time of or just before the cyclic period characterized by the cessation of shoot growth and the initiation of root growth in the parent plant rooted very successfully. Small shoots made the best cuttings, and an increase in leaf area up to 2 sq. in. per cutting gave a cor-

responding increase in root development and secondary top growth. A rooting medium of equal volumes of peat and sand proved satisfactory, with some suggestion that the proportion of sand should be increased after June 1. Although cuttings were rooted readily in various environments, such as solar frames, lath-covered benches, and cold frames, the last named was most successful because of low cost and easy construction coupled with good rooting. Chemicals as stimulants for rooting proved of no material significance.

A production and economic survey of the black raspberry industry of Washington County, Maryland, H. Ross and E. C. Auchter (*Maryland Sta. Bul. 322 (1930), pp. 207–245, figs. 26*).—This is a discussion of the methods of culture, fertilizing, pruning, harvesting, and marketing employed in producing black raspberries in Washington County, Md. Two general methods of planting were observed, namely, hill planting with an average of 2,000 plants per acre and row planting with an average of 4,971 plants per acre. The respective acre yields were 46.5 and 78.3 32-qt. crates, with estimated net profits per acre of $45.43 and $84.15. Four general types of pruning were followed in the district arranged in the following order of importance: (1) Young canes headed at 2 to 3 ft. in summer and laterals tied up and cut off near the top of the stake in the spring, (2) canes headed at 2 to 4 ft. with laterals cut to 6 to 8 in. when tied, (3) canes headed at 2 to 4 ft. with laterals cut to 3 to 4 in. in the spring, and (4) canes headed high or not at all, with practically all laterals removed in the spring.

Some climatic relations of the date palm in Egypt, A. K. M. Ghamrawy (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 97 (1930), pp. [2]+23*).—Briefly discussing the structure of the date palm, its ability to withstand a very wide range of temperature, and some of its growth requisites, the author divides the Nile Valley into three districts with respect to their adaptation to date growing.

Wastage in imported fruit: Its nature, extent, and prevention, J. Barker (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest., Spec. Rpt. 38 (1930), pp. VI+62, pls. 9, figs. 5*).—A survey is given of the situation in the British markets in respect to the decay of various imported fruits, with a discussion of factors concerned in these losses, such as improper packing and handling, adverse temperatures, and inadequate ventilation, accompanied by suggestions as to prevention. Certain results of experimental work bearing on the subject are cited.

FORESTRY

Marketing Illinois forest products, L. E. Sawyer (*Illinois Sta. Circ. 361 (1930), pp. 16, figs. 7*).—General information is offered on the estimation of timber, methods of grading, specifications for various products such as logs and crossties, shipping, marketing, drawing of sale contracts, etc.

DISEASES OF PLANTS

Protecting South Carolina from crop pests and plant diseases, J. A. Berly (*South Carolina Sta. Circ. 43 (1930), pp. 32, figs. 20*).—Various insect and fungus pests that threaten South Carolina crops are described and discussed, along with information on the regulations and control machinery that have been created to aid in the control and prevention of spread of various pests.

Breeding two new varieties of greenhouse tomatoes resistant to Fusarium wilt, W. A. Huelsen and M. C. Gillis (*Illinois Sta. Bul. 361 (1930), pp. 407–434, figs. 9*).—By combining the Grand Rapids Forcing tomato with field varieties possessing high resistance to Fusarium wilt, the authors succeeded

in developing desirable market greenhouse varieties, two of which here designated as Blair Forcing and Lloyd Forcing are said to possess high wilt resistance and an ability to set and mature fruit in late fall and winter as well as in more favorable seasons. Data are presented on the yields of the parental varieties and of the new varieties in comparison with their parents and with other forcing tomatoes. Careful descriptions are given of the two new varieties, with data as to their resistance to Fusarium wilt and other qualities.

Anthracnose of the avocado tree [trans. title], E. V. ABBOTT (*Estac. Expt. Agr. Soc. Nac. Agr., Lima, Circ. 13 (1929), pp. 10, figs. 4*).—In the districts of Santa Eulalia, Surco, and San Bartolome, Peru, avocado trees show a serious disease commonly called "rancha" which renders them unproductive and may gradually kill them. The anthracnose lesions are described as produced by *Physalospora perseae*. Bordeaux mixture is recommended.

Save black walnut from canker, C. R. ORTON and J. M. ASHCROFT (*West Virginia Sta. Circ. 58 (1930), pp. 3, figs. 6*).—This leaflet shows the distribution of the disease and presents information on symptoms, control methods, and losses.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A practicum of entomology, W. SCHOENICHEN (*Praktikum der Insektenkunde nach Biologisch-Ökologischen Gesichtspunkten. Jena: Gustav Fischer, 1930, 3. ed., rev., pp. X+256, figs. 301*).—This practicum of entomology deals with the subject under the headings of nine of the more important orders of insects.

An humidity apparatus, R. W. BURRELL (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 994–997, pls. 2*).—A relatively simple and inexpensive apparatus which may be used in the production of desired high humidity in rearing rooms and incubator cellars is described.

Densities of mixtures of air and various fumigants, R. C. ROARK and O. A. NELSON (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 985–987*).—Data on the densities and specific gravities of saturated mixtures of air and fumigants are given for some 28 compounds.

Kenya coal tar ant repellent, Kresotow, V. A. BECKLEY (*Kenya Colony Dept. Agr. Bul. 7 (1930), pp. 8*).—The author has found that with respect to grease-proof paper there is a variation in the penetrative powers both of the coal tar oils used as ant repellents and of the different fractions obtained by distillation. It has been found impossible, in practice, so to alter the oil, by the omission of the most penetrative of the fractions, that the penetrative powers will be reduced. Cellophane is recommended as a more efficient penetrative material.

Some physical properties of certain dormant oil emulsion-sulphur combinations, M. D. FARRAR and M. A. SMITH (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 979–985, pls. 2*).—A recent development in a dormant tree spray is decribed. The spray combines a type of oil emulsion and Flotation sulfur in such a manner as to give an efficient combination spray for San Jose scale and peach leaf curl. The methods of mixing and the physical properties of the combination are discussed.

The defoliation of gooseberries by sulphur-containing sprays, H. MARTIN (*Jour. Southeast. Agr. Col., Wye, Kent, No. 27 (1930), pp. 182–185*).—In a study made of the susceptibility of the Leveller variety of gooseberry to defoliation when sprayed with either 1 in 60 lime sulfur (3 per cent), dry-mix lime sulfur, or 0.4 per cent of Ialine colloidal sulfur (with 0.5 per cent soft soap), it was found that the addition of aluminum sulfate to the lime sulfur did not diminish

the amount of leaf fall. The experiments conducted failed to confirm the hypothesis that the constituents of lime sulfur responsible for defoliation are the soluble sulfides, and suggest that elementary sulfur is responsible.

Action of rotenone upon mammals when taken by mouth.—Preliminary report, D. E. BUCKINGHAM (*Indus. and Engin. Chem., 22 (1930), No. 10, pp. 1133, 1134*).—It was found that when administered by mouth pure rotenone produced no visible effects in dogs, cats, pigs, or sheep in doses (for dogs) up to 1 grain per pound of body weight. It is believed that even larger doses would be harmless. Derris extract (the ether extract of Derris root evaporated to dryness) when administered by mouth was likewise without visible effect on these animals.

Insects in relation to prickly pear control, F. G. C. TOOKE (*So. African Jour. Nat. Hist., 6 (1930), No. 5, pp. 386–393*).—This is a brief summary of prickly pear control work through utilization of insects being carried on in Australia, where, in Queensland and New South Wales, *Opuntia inermis* and *O. stricta*, natives of the coast of Florida and the adjacent islands, have infested 60,000,000 acres of land, and the rate of spread is now roughly estimated at 1,000,000 acres a year.

The more important injurious insects of Haiti, R. C. SMITH and A. AUDANT (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 972–979*).—The insects of importance in Haiti are listed under the headings of crops attacked.

[Notes on economic entomology] (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 1007–1014*).—The brief contributions here presented are as follows: Oriental Fruit Moth Infestation in Georgia Peach Belt, by O. I. Snapp and J. R. Thomson (p. 1007); Benjamin Franklin on Entomology, by T. E. Holloway (pp. 1007, 1008); A Suggestion for the Automatic Collection of Sitotroga, by S. E. Flanders (p. 1008); A Predacious Mite [*Anystis agilis* Bks.] on Alfalfa Thrips [*Frankliniella occidentalis* Perg.], by K. Sakimura (p. 1009); An Additional Statement concerning the Tank-mixture Method of Using Oil Spray, by R. H. Smith (pp. 1009–1011) (E. S. R., 63, p. 750); A Note on the Relation between Insecticidal Action and the Physical Properties of Soap Solutions, by P. A. van der Meulen (pp. 1011, 1012); *Hermetia illucens* L., a Pest in Sanitary Privies in Louisiana, by G. H. Bradley (pp. 1012, 1013); and Rotenone as a Moth-proofing Agent, by E. A. Back, R. T. Cotton, and R. C. Roark (p. 1014).

[Contributions on insects and related pests in Great Britain] (*East Malling [Kent] Research Sta. Ann. Rpt., 16 (1928), pt. 1, pp. 109–124*).—Following a summary of work in entomology (pp. 109–115), The Fruit Tree Red Spider (*Oligonychus ulmi* C. L. Koch) (pp. 116–122) and The Black Currant Gall Mite on Red Currants (pp. 123, 124), both by A. M. Massee, are considered.

[Contributions on economic insects] (*Ztschr. Angew. Ent., 16 (1930), Nos. 1, pp. 1–221, figs. 80; 2, pp. 229–416, figs. 96; 3, pp. 433–611, figs. 75*).—The contributions here presented (E. S. R., 63, p. 845) are as follows:

No. 1.—The Plum Sawflies *Hoplocampa minuta* Christ. and *H. flava* L. (Hym. Tenthr.), by L. Sprengel (pp. 1–86); Contributions on the Development and Feeding Habits of Native German Coccinellids, with Particular Reference to *Coccinella septempunctata* L., by A. Jöhnssen (pp. 87–158); Some New Information on the Biology and Physiology of *Dendrolimus pini* L., by A. G. Lebedev and A. N. Savenkov (pp. 159–177); Observations on the Development of the Eggs of *Anisoplia austriaca* Reitt., by J. Kerenski (pp. 178–188); On the After-effects of Poisoning the Pine Moth, by K. Friederichs and P. Steiner (pp. 189–196); The Epidemiology of the Pine Moth, by K. Friederichs (pp. 197–205); and On the Definition and Variability of Heteroptera of the Genus Eurydema, by H. von Lengerken (pp. 206–221).

No. 2.—A Contribution to the Knowledge of the Alate Females of the Woolly Apple Aphid and Their Progeny, by O. Jancke (pp. 229–303); The Biology of the Small Wax Moth *Achroia grisella* Fab., by G. Kunike (pp. 304–356); Experiments on the Respiratory Gas Exchanges in Insects and Their Significance in Questions of Applied Entomology, by F. Bock (pp. 357–376); Contributions to the Knowledge of the Question of Generations of *Oscinis frit* L., by R. Kleine (pp. 377–381); *Rhodophaea suavella* Zck. on Cotoneaster, by W. Ripper (pp. 382–387); Shepherd Spider or Harvestmen Eggs (Phalangiidae) on Sugar Beets, by L. Fulmek (pp. 388–391); The Production of Honeydew on *Pinus montana* in Austria by *Lachnus neubergi* n. sp., by L. Arnhart (pp. 392–398); The Future Possibilities of Entomology, by R. N. Chapman (pp. 399–408); Heterocyclic Bases as Substitutes for Nicotine and Their Examination for Suitability as Insecticides, by G. Höstermann and K. Rülke (pp. 408–413); On the Sense of Taste of Insects (pp. 413, 414); On the Absorption of Plant Pigment in the Body of Butterfly Larvae (p. 415) and Light and Insect Development (p. 415), both by Zwölfer; and The Founding of an International Union of Ipidology (pp. 415, 416).

No. 3.—On the Bases of a General Epidemiology of Insect Outbreaks, by F. S. Bodenheimer (pp. 433–450); A Contribution to the Knowledge of the Life History and the Phytopathological Importance of Some Cereal-inhabiting Thysanoptera, by A. Körting (pp. 451–512); Investigations of the Duration of the Egg Stage, Growth, and Metabolism of the Pine Geometrid *Bupalus piniarius* L., by F. Schwerdtfeger (pp. 513–526); The Probable Occurrence of Sex-Reversal among Lac Insects [English], by S. Mahdihassan (pp. 527–545); Mushroom Collembola: The Biology and Control of *Hypogastrura manubrialis* Tullbg., by W. Ripper (pp. 546–584); *Apion virens* Hbst. New as a Devastating Pest of Red Clover (Root Collar and Heart), by H. L. Werneck (pp. 585–591); On the Biology of *Anopheles maculipennis* Meig., by A. W. Masslow (pp. 592–596); On the Question of the Geographical Origin of the Mediterranean Flour Moth (*Ephestia kühniella* Zell.), by A. G. Lebedev (pp. 597–605); and Some Fundamentals of Insect Epidemiology, by F. S. Bodenheimer (pp. 606–611).

The Aphididae and Coccidae attacking Coniferae, F. Scheidter (*Die Läuse Unserer Nadelhölzer. Neudamm: J. Neumann, 1930, pp. VIII+119, figs. 68*).—A discussion of the aphids attacking conifers (pp. 4–86) is followed by an account of the coccids (pp. 87–97), of methods of combating these pests (pp. 98–104), tables for identification by their injury (pp. 105–110), and a bibliography of 116 titles.

Typha insects and their parasites, A. C. Cole, Jr. (*Ent. News, 42 (1931), Nos. 1, pp. 6–11; 2, pp. 35–39*).—An annotated list of 56 forms recorded by the author as attacking species of Typha.

The biology of Thysanoptera with reference to the cotton plant.—VI, The relation between the degree of infestation and the date of planting, E. I. MacGill (*Ann. Appl. Biol., 17 (1930), No. 4, pp. 767–774, figs. 4*).—This contribution is in continuation of those previously noted (E. S. R., 63, p. 355).

Observations on the influence of temperature and humidity **on the bionomics of Dysdercus cingulatus Fabr.,** D. R. Mehta (*Bul. Ent. Research, 21 (1930), No. 4, pp. 547–562, figs. 2*).—The experiments conducted and observations made are considered to prove that temperature and humidity are the two main factors which control the abundance of the red cotton bug (*D. cingulatus*) in the Punjab.

Field experiments on the control of the apple capsid (Plesiocoris rugicollis Fall.) and the common green capsid (Lygus pabulinus Linn.) during 1929, M. D. Austin (*Jour. Southeast. Agr. Col., Wye, Kent, No. 27*

(*1930*), *pp. 147–179, figs. 3*).—A report is given of tests made of various tar-distillate washes, nicotine dusts, and a nicotine spray in combating the apple capsid *P. rugicollis* (pp. 147–165). Of the tar-distillate washes, the Long Ashton wash ranked first, although one commercial product gave consistently good results. The grease banding of fruit trees was determined to be of great value, but where its use is impracticable soil treatment should be resorted to. The efficiency of nicotine dusts, which gave disappointing results, was greatly enhanced when applied in conjunction with grease banding. It is suggested that the use of tar-distillate washes be followed up by the spring application of a contact insecticide.

In control work with the common green capsid *L. pabulinus* on currants (pp. 165–176), the application of a tar-distillate wash even at 10 per cent strength was ineffective. Both nicotine dusts and the nicotine spray, especially where two applications of the dusts were made, proved of value, and it was found that their efficiency increased when the soil treatment was carried out. The earlier instars of the green capsid were more susceptible to nicotine dusts than the later stages, the early application of the insecticide being essential.

Ecological studies of the beet leaf hopper, W. Carter (*U. S. Dept. Agr., Tech. Bul. 206* (*1930*), *pp. 115, pls. 8, figs. 34*).—A brief discussion of the method of approach to the problem and a general outline of the life history of the beet leafhopper in southern Idaho are followed by discussions of the desert environment of the beet leafhopper (pp. 5–66) and the economic application of the data (pp. 66–110).

It is pointed out that perennial host plants probably maintained the insect before the advent of introduced hosts. "They are unimportant from the standpoint of economic populations but serve on occasion as important stages in the host-plant succession. Greasewood (*Sarcobatus vermiculatus* Torr.) is a favorable host from the standpoint of the measured factors, but balance has probably been struck between *E*[*utettix*] *tenellus* and its competitors so that predominance of *E. tenellus* is prevented on this host. A succession of host plants is normally provided, including the mustards (*Sophia sophia*, *S. filipes*, and *Sisymbrium altissimum*), *Atriplex rosea*, and *Salsola pestifer*, together with occasional hosts such as *Solanum triflorum*. *S. pestifer* is the most important late summer and fall host. The presence or absence of this plant determines in large measure the distribution and size of the populations of *E. tenellus* entering hibernation. The mustards are important spring hosts, since it is from these that the migrations take place in the area studied. Quantitative data from desert observation stations in 1926 and 1927 indicate relationships between host plants (maturity and cell-sap concentration), soil moisture, and populations of *E. tenellus*. Migration in the area studied is largely governed by host-plant relationships. It is probable that normally the insect does not migrate from *S. pestifer*."

Wheat take-all symptoms compared with injuries caused by chinch bugs, H. Fellows (*Phytopathology, 20* (*1930*), *No. 11, pp. 907–909, figs. 2*).—A comparison is made of the similarities and differences between take-all (*Ophiobolus graminis* Sacc.) and chinch bug injury.

Cicadas severely damaging Asparagus plumosus, J. W. Wilson (*Fla. Ent., 14* (*1930*), *No. 3, pp. 41–44*).—In this contribution from the Florida Experiment Station an account is given of injury to so-called "ferns" (*A. plumosus*) in the vicinity of Jupiter, Fla., where during the past two years the production has been noticeably reduced in quantity. But little is known of the life history and habits of the cicada implicated in the damage.

Tibicen davisi Smith and Grossbeck (Cicadidae) a new pest of economic importance, J. W. Wilson (*Fla. Ent., 14* (*1930*), *No. 4, pp. 61–65*).—*T. davisi*

was found to be the cicada implicated in the damage to *Asparagus plumosus* described in the account noted above.

[Results of the ninth and tenth years' work with the gipsy moth in New Jersey, 1928–29 and 1929–30], H. B. Weiss (*N. J. Dept. Agr. Circs. 169 (1929), pp. 9, fig. 1; 189 (1930), pp. 9, figs. 2*).—These reports with details of the eradication work with the gipsy moth in New Jersey for the years 1928–29 and 1929–30 are in continuation of those previously noted (E. S. R., 61, p. 550). Though work was carried on in all the places and areas found infested the preceding year, no trace of the gipsy moth was discovered in 1929–30.

Four moths of the family Limacodidae injurious to coconut palms, W. H. T. Tams (*Bul. Ent. Research, 21 (1930), No. 4, pp. 489, 490, pl. 1*).—Three moths known to damage palms in Celebes, namely, *Orthocraspeda catenatus* Snell., *Altha alastor* n. sp., and *Thosea porthetes* n. sp., and a fourth which attacks coconut foliage in the Gold Coast, *T. chrysoparala* n. sp., are characterized.

Further results with trap baits for capturing the codling moth, M. A. Yothers (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 923–929, figs. 2*).—This is a report of the fifth year's tests made in 1928 with trap baits for capturing the codling moth, in continuation of that previously noted (E. S. R., 63, p. 849).

"Of the several kinds of baits compared, malt sirup, cane molasses, beet molasses, and brown sugar and geraniol were the more promising. Dilutions of 1–10 are probably only slightly more efficient for most of these baits than dilutions of 1–20. Variations in temperature had greater effect upon the number of moths captured than the dilution of materials had. Geraniol added to brown sugar and water and to beet molasses increased their effectiveness. In a comparison of the effectiveness of bread yeast with wild yeast added to baits, the results were too variable to warrant conclusions one way or another. The catch of moths per trap increased with the number of trees available from which to attract them, but not in direct ratio. Great numbers of moths can be captured with bait traps in badly infested orchards."

A comparison of untreated banding materials for capturing codling moth larvae, M. A. Yothers (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 930–936, figs. 2*).—It is concluded that "paper-burlap bands are as effective as the 3-ply burlap customarily used and cost much less. Four-in., single-thickness paper-burlap bands were apparently not quite so efficient as single-thickness 8-in. bands. Folding the 8-in. paper-burlap bands to double thickness with the open edge down, did not increase their effectiveness. Four-in. paper burlap was slightly more effective applied as a single thickness than when folded to 2-ply with the open edge down. The 2-in. band thus formed was apparently too narrow. Three-ply, 4-in. burlap proved more efficient than 2-ply whether 6 or 8 in. in width. Crêpe paper, light colored, single thickness, 4 in. wide, was next to the least effective in both tests in 1927, and the least effective in the 1928 test. Four-in. paper burlap on both trunk and limbs was apparently somewhat more effective than on trunks alone."

Laboratory tests of miscellaneous chemicals against the codling moth, L. C. McAlister, Jr., and E. R. Van Leeuwen (*Jour. Econ. Ent. 23 (1930), No. 6, pp. 907–922*).—This is a report of studies made during the years 1920 to 1928, inclusive, of the toxicity of many materials to newly hatched codling moth larvae, the details of which are presented in tabular form. While no chemical was found that will serve as a substitute for lead arsenate in a practical way, several materials were discovered to be strongly toxic to codling moth larvae.

Correlation of corn borer population with degree of damage, C. R. Neiswander and E. A. Herr (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 938–945, figs. 2*).—In work at the Ohio Experiment Station, varying populations of the European corn borer were established on different plats of each of three varieties of corn and the resulting effect on yield ascertained. It was found that within the variety there was a direct correlation between borer population and reduction in yield, and that for the three varieties under observation there was an inverse correlation between percentage reduction in yield and length of season between planting and silking.

The relation of the habitat to European corn borer populations, J. R. Savage (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 936–938*).—In studies at the Ohio Experiment Station the author has found differences in habitats within the corn borer infested area to offer a reasonable explanation of the differences in populations occurring in Ohio.

Ephestia elutella Hubner, a new pest of cured tobacco in the United States, E. A. Back and W. D. Reed (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 1004–1006*).—The authors report that the moth *E. elutella* was found for the first time August 8, 1930, infesting stored leaf tobacco in a small number of warehouses in Richmond, Va. It is pointed out that while this insect is cosmopolitan in distribution and has been reported as feeding upon a wide range of agricultural products, including tobacco, its presence in destructive numbers has stirred the tobacco industry to prompt action looking toward effective control.

On the life-history of Blastodacna atra Haw., the pith moth of the apple, M. Miles (*Ann. Appl. Biol., 17 (1930), No. 4, pp. 775–795, pls. 2, figs. 3*).—An account is given of the morphology, biology, natural enemies, and economic importance of, and control measures for this persistent pest in fruit plantations in northern Europe, occurring commonly in England, Netherlands, Germany, Norway, Sweden, Denmark, and Poland. Although the pest is only occasionally reported as responsible for serious loss, signs of its appearance may be detected in most fruit plantations, and it is possible that the cumulative effects of slight annual attacks have been underestimated.

The damage is caused by the larvae which feed beneath the bark, often eating out the entire white tissue and destroying vegetative shoots and blossom trusses. Immediately on hatching, the first half of August, the larvae tunnel into the bark of the twigs without first feeding on the leaves. They continue to feed during the winter, weather conditions having no appreciable influence on their activities. Previously recommended control measures are discussed in relation to the life history and habits of the insect as here recorded.

Beebea guglielmi Schaus, a pyralid moth borer of the Opuntia cactus in the Galapagos Islands, F. X. Williams (*Pan-Pacific Ent., 7 (1930), No. 1, pp. 1–4, figs. 5*).—A brief account of a pyralid moth borer which is abundant on pricklypear cactus in the Galapagos Islands although not a source of much damage.

Ox warble fly: Report on the demonstrations and experiments, 1930, R. C. Gaut (*Worcester: Worcestershire Co. Council, Dept. Agr. Ed., 1930, pp. [1]+47, pls. 2, fig. 1*).—This is a report of work conducted in 1930 (E. S. R., 62, p. 857) in an attempt to demonstrate to farmers an inexpensive and easy method of dressing cattle for the extermination of ox warbles during spring, and to determine if it be possible to eliminate the warble pest from selected areas by following an organized campaign of periodic dressings.

The control of warble flies in North Wales, W. M. Davies (*Jour. Min. Agr. [Gt. Brit.], 37 (1930), No. 9, pp. 862–870, pl. 1*).—This is a report upon control

work in which use was made particularly of Derris powder wash, it having been found highly efficient in the destruction of the warble fly larvae when applied under ordinary farm conditons.

Preliminary report on a study of the biology of Lixophaga diatraeae Tns., L. C. Scaramuzza (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 999–1004*).—In Cuba the tachinid *L. diatraeae* is the most important larval parasite of the sugarcane borer, parasitism reaching as high as 40 per cent during spring and summer. "The flies are larviparous, and borer larvae can be inoculated by dissecting gravid females and placing maggots on the host. There are three larval stages, of which parts of the first and second are attached to the trachea of the host while the third is always free within the host body. Six to 7 days are required for the prelarviposition period, 5.5 to 13 days in the larval stages, and 9 to 11 days in the pupal stage, making 20.5 to 32 days for the complete cycle."

A new tachinid parasitic on a sawfly, C. H. Curran (*Canad. Ent., 62 (1930), No. 11, pp. 246, 247*).—A tachinid parasitic on a sawfly of the genus Neodiprion from Mont Laurier, Que., is described as new under the name *Spathimeigenia aurifrons*.

The wintering of the Natal fruit-fly, L. B. Ripley and G. A. Hepburn (*Farming in So. Africa, 5 (1930), No. 57, pp. 439–441, fig. 1*).—It is concluded that the Natal fruit fly (*Pterandrus rosa* (Karsch)) can not survive the entire winter in orchards under the climatic conditions of Cedara. The puparia can not hibernate, winter being passed only in the adult stage. In the absence of an adequate food supply the flies can not survive the winter. It is considered evident that the flies which invade the orchards during November have bred in the bugtree (*Solanum auriculatum*) fruits during the spring.

Fly trapping on the ranges of the Southwest, E. W. Laake and E. C. Cushing (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 966–972*).—The authors report that the use of flytraps on the stock ranges of the Southwest has become somewhat extensive. In cooperative tests approximately 200 square miles of ranch land were trapped in Menard County, Tex., in 1929. "In comparison with a similar untrapped area a reduction of 36.2 per cent of the fly population in the trapped area by reason of the trapping was indicated. The most effective bait was found to be 2 lbs. of fresh meat to which is added 2 gal. of water and nicotine sulfate at the rate of 4 cc. per gallon of water. The frequency of renewing baits and refilling bait pans with water is dependent upon weather conditions.

"While systematic organized fly trapping activities gave promise of a distinct reduction in screw worm and fleece worm losses, the present prospects are that effective control can only be brought about by a combination of destruction of carcasses and trapping supplemented by approved ranch practices and the possible utilization of parasites and predators of these blowflies."

Recent developments in blowfly research (*Jour. Council Sci. and Indus. Research [Aust.], 3 (1930), No. 4, pp. 212–219*).—This is a discussion of the blowflies responsible for strike, environmental and population studies, and the relation of fly population to strike in sheep.

The relation of the cabbage maggot and other insects to the spread and development of soft rot of Cruciferae, D. E. Johnson (*Phytopathology, 20 (1930), No. 11, pp. 857–872, fig. 1*).—This contribution from the Minnesota Experiment Station gives an account of the bacterial soft rot of cabbage, with special reference to the close association of the cabbage maggot throughout its entire life cycle in the dissemination of the pathogene and the development of the disease. Cabbage maggot larvae that had been feeding upon decaying

cabbage tissue inoculated fresh cabbage leaves with soft-rot bacteria which reduced them to a decayed mass. The constant lacerations from the maggot prevented the wounded tissue from healing over and checking the decay.

The study led to the conclusion that the larvae of this maggot as well as those of closely related species may serve as agents of dissemination and inoculation of the soft-rot bacteria. Certain insect parasites of the cabbage maggot were found to disseminate the same type of bacteria, but they appear to be of little economic importance in this respect.

A qualitative analysis of the digestive secretions of the larva of the Japanese beetle (Popillia japonica Newm.), M. C. SWINGLE (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 956–958*).—An analysis made of the secretions of the digestive tract of larvae has shown the presence of the basic ions of aluminum, ferrous iron, calcium, magnesium, potassium, sodium, and ammonium. The acidic ions found present were the carbonate, chloride, nitrite, and phosphate.

The Japanese beetle, present status and control, L. B. SMITH (*Acad. Nat. Sci. Phila. Yearbook, 1928, pp. 5–15, pls. 3*).—A brief discussion of the present status of this pest in the infested area and of its control.

The effect of temperature, relative humidity, and exposure to sunlight upon the Mexican bean beetle, D. F. MILLER (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 945–955, figs. 4*).—Laboratory experiments and field tests conducted indicate that there is a specific relation between relative humidities and temperatures in the survival of the Mexican bean beetle at high summer temperatures.

Notes on the Solanum tortoise beetle (Aspidomorpha hybrida Boh., Cassidae), with especial reference to the eastern Transvaal, J. S. TAYLOR (*So. African Jour. Nat. Hist., 6 (1930), No. 5, pp. 382–385, pl. 1*).—Notes are given on the biology of *A. hybrida*, a tortoise beetle which occurs commonly throughout the Transvaal, the eastern Cape Province, and probably the other parts of the Union of South Africa, where both adults and larvae feed upon the foliage of *S. sodomaemum*.

Entomological control of St. John's wort—first liberations of Chrysomela beetles, R. J. TILLYARD (*Jour. Council Sci. and Indus. Research [Aust.], 3 (1930), No. 4, pp. 231, 232*).—A record is made of the liberation of three species of chrysomelids, namely, *C. varians*, *C. didymata*, and *C. hyperici*, in combating St. John's wort.

A comparison of the toxicity of para-dichlorobenzene and naphthalene to the confused flour beetle (Tribolium confusum Duv.) (Coleoptera), R. S. LEHMAN (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 958–966, figs. 5*).—Large numbers of *T. confusum* were treated under controlled conditions with naphthalene and paradichlorobenzene, the apparatus consisting chiefly of a closed system in which air was drawn over sulfuric acid to give the desired humidity and then through the compound before going through the exposure bottles. "The entire system was confined in a constant temperature chamber maintained at 30° C. Saturated paradichlorobenzene acts as a strong anesthetic to *T. confusum*. On the basis of the time required to kill 50 per cent of the insects, naphthalene was found to be from 10 to 14 times as toxic to *T. confusum* as paradichlorobenzene at the same concentration."

A soil-washing device for use in wireworm investigations, F. H. SHIRCK (*Jour. Econ. Ent., 23 (1930), No. 6, pp. 991–994, pl. 1, fig. 1*).—An apparatus for separating eggs and young larvae of wireworms from field samples of soil by washing is described and illustrated.

Biology of the Mexican cotton boll weevil, V, VI, E. F. GROSSMAN (*Fla. Ent., 14 (1930), Nos. 3, pp. 45–52, fig. 1; 4, pp. 66–71*).—Part 5 of this contribu-

tion from the Florida Experiment Station (E. S. R., 62, p. 456) deals with Diurnal Observations of the Emergence of Boll Weevils from Their Hibernation Quarters; part 6 deals with Some Humidity and Temperature Effects on Development and Longevity.

Time of hatching first generation boll weevils relative to appearance of blossoms, P. CALHOUN (*Fla. Ent., 14 (1930), No. 4, pp. 72–75, fig. 1*).—This contribution from the Florida Experiment Station includes information in tabular form on the time required for both upland and sea island squares of various sizes to bloom. The time required for squares to bloom, sizes of squares being measured, is charted.

Studies on the galleries of the bark-beetles, I. TRÄGÅRDH (*Bul. Ent. Research, 21 (1930), No. 4, pp. 469–480, figs. 7*).—This is a contribution from the Royal Swedish Institute of Experimental Forestry.

The metabolism of the honeybee colony during winter, C. L. CORKINS (*Wyoming Sta. Bul. 175 (1930), pp. 54, figs. 16*).—Following a review of the literature, the subject is taken up under the headings of technic, the mean daily loss in weight correlated with cold v. warm periods, temperature levels within the cluster in relation to surrounding temperatures as an index to metabolic rate, cluster expansion and contraction in relation to external temperatures, and a general discussion.

The data, based upon four years' experimentation upon the metabolism of the honeybee colony during the winter, indicate that as external temperatures decline below the clustering temperature the metabolic rate is not materially increased or possibly is not increased at all.

Disinfection of American foulbrood combs by fumigation with formaldehyde, I, C. E. BURNSIDE (*Bee World, 12 (1931), No. 1, pp. 3–7*).—This account, which is to be continued, includes much tabular data on the cultural results of tests with samples of combs fumigated with formaldehyde for different periods in 0.5-gal. clear glass fruit jars.

Races of Trichogramma minutum, S. E. FLANDERS (*Pan-Pacific Ent., 7 (1930), No. 1, pp. 20, 21*).—This is a brief contribution from the California Citrus Experiment Station in which the races of *T. minutum* are listed in the order of their lengthening life cycle, namely, (1) a dark short cycle race, (2) a yellow race, (3) a transition race, (4) a gray race, and (5) a dark long cycle race.

ANIMAL PRODUCTION

Report on the nutritive values of meat-meals, E. A. POPE (*New Zeal. Dept. Sci. and Indus. Research Bul. 12 (1929), pp. 27, figs. 41*).—Results of a series of studies conducted at the Otago Medical School, Dunedin, New Zealand, are reported in this bulletin.

The biological value of the proteins of four meat meals containing no bone was so much higher than those of four meat meals containing a large proportion of bone that it was necessary to use from 30 to 40 per cent more of the meals containing bone to furnish the same amount of protein.

The vitamin A content of two of the meals was such that when fed at a 10 per cent protein level they required no vitamin supplement, while one meal was markedly improved by a supplement, and two meals were entirely devoid of vitamin A. Five meals were found to be uniformly lacking in vitamin B. Purified tallow of the two meals rich in vitamin A contained little or no vitamin, which indicated that the destruction of the vitamin takes place during purification of the tallow and not during the process of manufacture of the meal. Tallows from four of the meals were found to contain appreciable amounts of vitamin D.

From a nutritive standpoint there was little difference in meals manufactured by the wet and dry process. It was evident that the nature and proportions of the raw materials determined the value of the meals.

Feedlot fattening rations for cattle, G. E. Morton, E. J. Maynard, and H. B. Osland (*Colorado Sta. Press Bul. 74* (*1930*), *pp. 8*).—Continuing this study (E. S. R., 62, p. 253), 6 lots of 10 calves each, averaging 421.8 lbs. per head, were fed for 195 days. All the lots received barley, cottonseed cake, and alfalfa hay, and in addition the respective lots received the following feeds: Ensiled beet pulp and cull potatoes; ensiled beet pulp; cull potato and corn fodder silage; corn silage; cull potatoes; and the basal ration only. The barley fed to all lots was ground. The average daily gains, based on market weights, in the respective lots were 1.92, 1.91, 1.85, 1.84, 1.68, and 1.83 lbs. per head.

In this test each ton of ensiled beet pulp fed replaced 115.1 lbs. of barley, 3.23 lbs. of cottonseed cake, and 378.1 lbs. of alfalfa hay; had a feed replacement value of $4.38 per ton; and increased the rate and economy of gain and the selling price as compared to the check ration of barley, cottonseed cake, and alfalfa hay. Each ton of corn silage replaced 196.7 lbs. of barley, 1.1 lbs. of cottonseed cake, and 760.1 lbs. of alfalfa hay; had a feed replacement value of $8.18 per ton; and increased the rate and economy of gain, but decreased the selling price somewhat as compared with the check ration. A ton of potato and corn fodder silage replaced 201.2 lbs. of barley, 1.5 lbs. of cottonseed cake, and 722 lbs. of alfalfa hay; had a feed replacement value of $8 per ton; and increased the rate and economy of gain, but decreased the selling price. A ton of cull potatoes replaced 101.1 lbs. of barley and 369.1 lbs. of alfalfa hay, but required 10.4 lbs. more of cottonseed cake per 100 lbs. of gain. The potatoes had a feed replacement value of $3.79 per ton. In combination with pulp, cull potatoes increased the rate and economy of gain, but decreased the selling price.

A study of pulp storage showed that the percentage of loss when stored in a dirt trench silo was 24.48, in a straw silo 29.33, and in open piles on the ground 34.35. Most of this loss apparently represents evaporation and surface decomposition.

Comparison of roughages for finishing steers, D. S. Buchanan (*Mississippi Sta. Bul. 278* (*1930*), *pp. 11, figs. 8*).—The third phase of this study (E. S. R., 62, p. 161) was an exact duplication of the second phase feeding schedule. The 5 lots consisted of 8 head each, averaging approximately 876 lbs. per head. The average daily gains in the respective lots were 1.79, 1.74, 1.47, 1.69, and 1.24 lbs. per head. The cost per 100 lbs. of gain was cheapest in lot 4, followed in ascending order by lots 2, 3, 1, and 5, while the margin of profit per steer was highest in lot 1, followed in descending order by lots 2, 4, and 3, and lot 5 showed a loss per steer.

Over a 3-year period the average yield of silage per acre was corn 8.07 tons, sorghum 19.61 tons, and sagrain 10.56 tons. On thin lands and under variable rainfall conditions, sorghum proved to be a more certain crop and produced a greater tonnage of silage than corn. Sagrain was particularly adapted as a silage crop to certain sections of the Mississippi Delta. On the other hand, sagrain was not easily cured into a bright, palatable silage and had to be left standing in the field until the seed began to shatter.

In these tests 100 lbs. of cottonseed hulls were equal in feeding value to 189 lbs. of corn silage, 272 lbs. of sorghum silage, and 249 lbs. of sagrain silage. When fed with cottonseed meal and hay, cottonseed hulls produced satisfactory gains on mature steers. The ration composed of Johnson grass hay and cottonseed meal did not produce as rapid gains nor return as large profits as the other rations.

Feedlot fattening rations for lambs, G. E. Morton, E. J. Maynard, and H. B. Osland (*Colorado Sta. Press Bul. 73 (1930), pp. 12*).—Continuing the feeding studies (E. S. R., 61, p. 760), grade range lambs were divided into 15 lots of 25 head each, averaging approximately 68.3 lbs. per head, and were fed for 127 days. All lots, except lots 13 and 14, received alfalfa hay. These lots received alfalfa meal and alfalfa stem meal, respectively. The remaining portions of the rations in the respective lots were shelled corn; whole barley and cottonseed meal; whole barley and cull potatoes; whole barley with potato and corn fodder silage; shelled corn and beet molasses (final discard); whole barley; shelled corn and beet molasses (Steffens discard); whole barley and ensiled beet pulp; shelled corn and beet molasses (foreign); whole barley, ensiled beet pulp, and cottonseed meal; shelled corn and cane molasses; barley, beet molasses (Steffens discard), cottonseed meal, and alfalfa meal (ground, mixed, and self-fed); barley, beet molasses (Steffens discard), cottonseed meal, and alfalfa stem meal (ground, mixed, and self-fed); whole barley, cull potatoes, and cottonseed meal; and whole barley, potato and corn fodder silage, and cottonseed meal.

The average daily gains in the respective lots, based on market weights, were 0.25, 0.24, 0.25, 0.23, 0.26, 0.24, 0.25, 0.27, 0.26, 0.29, 0.25, 0.26, 0.26, 0.27, and 0.25 lb. per head.

The whole barley used in this study had 89.2 per cent the feeding value of the yellow corn. Barley gave better results when fed with wet pulp than when fed with hay only. The cull potatoes had a feed replacement value of $5.96 per ton, while the potato and corn fodder silage, consisting of 80 per cent of potatoes and 20 per cent of corn fodder, had a value of $6.33 per ton. The barley, ensiled beet pulp, and alfalfa hay ration produced the cheapest and most efficient gains. The beet pulp had a feed replacement value of $3.92 per ton. Adding cottonseed meal to rations in this test was not profitable. The relative feed replacement value of the molasses used in this study was for final discard molasses $23.07, foreign beet molasses $19.55, Steffens discard beet molasses $13.17, and cane molasses $10.96 per ton.

The coat of the Angora goat, J. E. Duerden and M. R. Spencer (*Union So. Africa Dept. Agr. Bul. 83 (1930), pp. 35, figs. 14*).—In this study, carried out mainly at the Wool Research Laboratory, Rhodes University College, Union of South Africa, an attempt was made to describe and interpret the covering of the Angora goat from birth to maturity.

Kids were found to have a covering of hair arranged in spiral tufts, which varied in size, closeness, and regularity of formation. Each tuft consisted of long, coarse, strongly medullated kemp fibers and short, fine, woolly fibers. During the change from kid to adult most of the kemp fibers are shed within a few months, and the wool fibers increase in number and length until the adult fleece is composed almost entirely of wool. During the transformation period the tufts continue the spiral formation and eventually form the locks or ringlets of the adult fleece. The locks vary by having right- or left-handed spirals, and in a single lock one or more reversals may occur, which probably serve to prevent cotting. Some locks are perfectly formed, compact, and free for the entire length of the fleece, but usually the contiguous locks are joined by strands of fiber or completely twisted around one another. A certain number of kemp fibers occur in practically all adult fleeces, but are highly objectionable.

The wool fibers of the Angora goat are longer and stronger than those of Merino sheep. The mean thickness of the former varies from 28 to 38μ and of the latter from 15 to 24μ. The fibers of the Angora are usually nonmedullated. The fleece may also contain a third type of fiber, kempy in the upper

part and fine and woolly below. The wool fibers grow continuously with a certain proportion shed yearly, while the kemp is always shed. Complete shedding of the coat may occur in poorly bred Angoras and under adverse conditions of climate and nutrition.

The results of some selective breeding work to improve the fleece of Angora goats are discussed.

A method of determining the variations in the vertebral column of the live pig, A. M. SHAW (*Sci. Agr., 10 (1930), No. 10, pp. 690–695, figs. 4*).—Continuing this study at the University of Saskatchewan (E. S. R., 62, p. 550), the author describes a method by which it is possible to determine the number of ribs and vertebrae in the thoracic and lumbar regions of the live pig. The determination is made by means of radiographs taken when pigs are from 6 to 8 days old.

The importance of solar radiation in the development of growing pigs, A. M. SHAW (*Sci. Agr., 11 (1930), No. 1, pp. 1–8, figs. 4*).—A series of four tests with young, growing pigs was conducted at the University of Saskatchewan with light as the only variable. It was found that direct light was necessary for the normal development of pigs. Young pigs fed a well-balanced ration but deprived of light developed rickets, while similar pigs fed the same ration but having access to open yards did not develop rickets. Light filtered through ordinary window glass was of little value for preventing rickets, while Vitaglass had a doubtful value. Fresh green legumes fed in abundance prevented rickets.

Young pigs showed the effect of restricted light sooner than older pigs, and pigs that had developed normally to 3 or 4 months of age were able to withstand comparatively long periods of restricted light. Access to direct light caused a rapid improvement in affected pigs and eventually restored pigs, even when in advanced stages of rickets, to a marketable condition. Aside from the rachitic condition, the pigs having access to direct light made significantly larger gains than other lots in this study.

Fattening pigs for market, A. W. OLIVER and E. L. POTTER (*Oregon Sta. Bul. 269 (1930), pp. 22, fig. 1*).—This bulletin, based on experimental work in pig feeding conducted through a series of years at the Oregon Experiment Station at Corvallis and at the Eastern Oregon Substation at Union, is designed to provide information immediately applicable to fattening market pigs under Oregon conditions. The text is divided into the following parts: Important consideration in balancing rations, preparation of feeds and methods of feeding, grinding and soaking, cooking, methods of feeding, and feeding stuffs.

Three years of Record of Performance work in Ohio, G. S. VICKERS (*Poultry Sci., 9 (1930), No. 6, pp. 361, 362*).—The improvement in egg production and egg size during the three years of Record of Performance work is noted in this article.

Yolk assimilation during the embryonic development of the chick, M. A. JULL and B. W. HEYWANG (*Poultry Sci., 9 (1930), No. 6, pp. 393–404*).—In this study by the Bureau of Animal Industry, U. S. D. A., 251 eggs from 11 hens were weighed and incubated. The mean weight of the eggs per hen, the mean percentage chick weight at hatching time of the original egg weight, and the mean percentage yolk weight of the chick were determined.

It was found that the percentage yolk weight of chick weight at hatching time varied among hens, and sometimes between different pairs of hens. The percentage yolk weight of chick weight was independent of sex. The percentage chick weight of initial egg weight was independent of initial egg weight and of sex, but varied with different hens.

The rate of yolk assimilation during embryonic development sometimes varied significantly between hens, and similar variations were found in the correlation between initial egg weight and chick weight at hatching time minus unassimilated yolk. There were variations between hens in the correlation between initial yolk weight and chick weight at hatching time minus unassimilated yolk. The hen's genetic constitution evidently determined the rate of yolk assimilation during the embryonic stage.

The operation of battery brooders, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 19 (1930), No. 3, pp. 4, fig. 1*).—The use of battery brooders for raising chicks, the temperature, feed, light, and space requirements, the prevention of disease, and the future of battery brooders in the poultry industry are discussed in this publication.

The relation of the protein requirement of chicks to the rate of growth.—I, The quantity of protein required by chicks during early growth, L. C. Norris and G. F. Heuser (*Poultry Sci., 9 (1930), No. 6, pp. 378–392, figs. 2*).—In two experiments with chicks at the New York Cornell Experiment Station, it was found that for the first 8 weeks after hatching chicks receiving a ration containing approximately 20 per cent of protein made the greatest growth. The growth curves of the lots receiving 20 and from 15 to 16 per cent of protein paralleled each other after the first 8 weeks, indicating that the protein requirement was in the neighborhood of the lower amount after the first 8 weeks.

The protein utilization of chicks of the same age decreased with each increment of protein, while the efficiency of feed utilization increased with each increment of protein. The efficient utilization of both feed and protein decreased as the chicks grew older. The differences in growth of chicks in these experiments when receiving approximately the same amount of protein were probably due to differences in the quality of the proteins used.

These studies indicate the need of a basal ration containing proteins of superior biological value, and of a protein supplement, purified of all known nutritive factors, of equal biological value in order to determine accurately the protein requirement of chicks.

Rate of growth in Bronze and White Holland turkeys, E. M. Funk (*Poultry Sci., 9 (1930), No. 6, pp. 343–355, fig. 1*).—Continuing this study at the Pennsylvania Experiment Station (E. S. R., 63, p. 471), no significant correlation was found between day-old weights and subsequent weights of turkeys. There were, however, significant positive correlations between weights of turkeys at 4, 8, 12, 16, 20, and 24 weeks of age. There was a significant positive correlation between growth made during any two periods in all cases except the growth made by the males during 0 to 4 and 17 to 24 weeks. It was evident that early in life turkeys establish a rather definite rate of growth. In this study weights were more closely correlated than growth.

Turkeys vary less in weight than chickens, the greatest variations occurring at 4 and 8 weeks of age, and the coefficients of variability decrease as maturity is reached. Turkeys make greater relative gains than chickens, and sex differences in rate of growth are larger in turkeys.

DAIRY FARMING—DAIRYING

A study of the standardization of acid in cream for butter-making under South African conditions, H. B. Davel (*Transvaal Univ. Col., Pretoria, Bul. 16 (1929), pp. 18*).—In this study it was found that creams having an acidity of 0.5 per cent and upward when partially neutralized produced butters which were slightly superior in flavor when fresh and usually had better keeping qual-

ities than butters made from the same cream but not neutralized. When the acidity was 0.4 per cent or lower the butters made from pasteurized but not standardized cream had the best keeping qualities, while the raw cream butters had the best flavor when fresh. Pasteurizing creams with an acidity of 0.5 per cent and upward was not satisfactory as the sole means of processing cream, for, while it destroyed most of the microorganisms it did not remove the acids, which are of the most importance in the deterioration of the butter. However, there was a reduction of about 0.05 per cent in the acidity of the cream during pasteurization, due to the driving off of volatile substances. While the neutralized cream butters had the better keeping qualities under the storage temperatures available, they began to deteriorate in from 60 to 90 days.

Of the neutralizers used in this study, lime gave the best results when the acidity was not reduced below 0.3 per cent. At a lower point the butter tended to have a bitterish, limy, and often unpleasant flavor. The commercial neutralizers gave best results when the acidity was reduced to 0.25 per cent, but were not satisfactory with high-acid creams. Bicarbonate often imparted a flavor to the butter and did not give as good results as the other neutralizers used.

A case of metallic discoloration of Cheddar cheese, E. G. Hood and A. H. White (*Sci. Agr., 10 (1930), No. 8, pp. 520–522, figs. 2*).—In this article from the Canadian Department of Agriculture the authors describe a discoloration of Cheddar cheese caused by pieces of steel wool. The steel wool was used for scouring and cleaning vats, and small particles and pieces that broke off found their way into the curd, causing the defect.

VETERINARY MEDICINE

Practical veterinary pharmacology, materia medica, and therapeutics, H. J. Milks (*Chicago: Alexander Eger, 1930, 2. ed., pp. XI+11–539, figs. 33*).—This second edition of the work previously noted (E. S. R., 38, p. 580) has been mostly rewritten and entirely reset. The author was assisted in the work by M. C. Hall and W. H. Wright, who revised the chapter on vermicides and vermifuges, and by E. L. Brunett, who assisted in preparing the section on the treatment of internal parasites of chickens. The edition includes a chapter on biological therapeutics prepared by A. Eichhorn (pp. 467–510).

Hydrogen-ion concentration of the digestive tracts of some domestic animals, A. R. McLaughlin (*Cornell Vet., 20 (1930), No. 4, pp. 378–380*).—This is a contribution from the Wyoming Experiment Station in which tables are given with the author's determinations of the pH of the digestive tracts of the fowl, rabbit, and cat.

Feeding value of alfalfa hay treated with calcium arsenate, H. J. Frederick (*Utah Sta. Bul. 223 (1930), pp. 8, figs. 4*).—This is a detailed report of a study made of the effect of calcium arsenate dust applied to alfalfa in combating the alfalfa weevil upon livestock (E. S. R., 63, p. 672). Alfalfa hay dusted with 6 lbs. of calcium arsenate to the acre fed to livestock that had been for 40 days on a diet of alfalfa that had been dusted with 3 lbs. of calcium arsenate to the acre showed no detrimental effects, although some cattle did not gain in weight. The horses gained during the entire feeding period, each of them increasing over 100 lbs. in weight and presenting a sleek, glossy appearance. The sheep gained during the entire experimental period and weighed 130 lbs. more at the close of the test than before, and their fleece appeared as good, if not better, than did the fleece of sheep fed on untreated hay.

It is concluded that alfalfa dusted with 2 lbs. of calcium arsenate to the acre, the amount commonly used for destroying the alfalfa weevil, may be fed to livestock with impunity for at least one feeding season—4 to 6 months. Where treated alfalfa hay was fed, more water but not so much hay was consumed, the arsenic in the treated hay seemingly acting as a stimulant or tonic for the animals.

Man and animal in infectious disease cycles: The connection between diseases in man and the lower animals, T. van Heelsbergen (*Mensch und Tier im Zyklus des Kontagiums: Der Zusammenhang zwischen Krankheiten bei Mensch und Tier. Stuttgart: Ferdinand Enke, 1930, pp. XV+167, pl. 1*).—This work deals with the subject under the headings of diseases caused by bacteria (pp. 1–51), by rickettsiae (pp. 51–54), Bartonella (pp. 54–56), filtrable viruses (pp. 56–112), spirochetes (pp. 112–122), protozoa (pp. 122–142), phytoparasites (pp. 142–148), insects (pp. 148–153), helminths (pp. 153–160), and those not of a parasitic nature (pp. 160–167).

The experimental transmission of anaplasmosis by Rhipicephalus sanguineus, C. W. Rees (*North Amer. Vet., 11 (1930), No. 9, pp. 17–20, figs. 2*).—The author succeeded under properly checked and controlled conditions in transmitting anaplasmosis through the brown dog tick, the ticks engorging as larvae on a clinical case of the disease and transmitting it as nymphs to a susceptible animal. It is pointed out, however, that the distribution of this tick precludes the idea that it is the only tick outside the range of the cattle tick which carries anaplasmosis, the present evidence suggesting that at least two other species may be involved.

The interagglutinability of members of the Brucella and Pasteurella genera, W. L. Mallmann (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 636–638*).—This is a preliminary report on the interagglutinability of members of the Brucella and Pasteurella groups based upon work at the Michigan Experiment Station. Brucella-immune sera were found to agglutinate Pasteurella and Pfeiferella antigens, and Pasteurella-immune sera were found to agglutinate Brucella antigens.

A comparison of factors influencing the agglutination test for Brucella abortus, B. S. Henry and J. Traum (*Jour. Infect. Diseases, 47 (1930), No. 5, pp. 367–379, fig. 1*).—In work at the California Experiment Station with the tube method of testing, formolized antigen was found to have a tendency to intensify or cause proagglutination with human, bovine, and porcine serums to such an extent that occasionally strongly positive serums might be missed in routine mass testing. "In the same serums tested with phenolized or tricresolized antigen, the interference is absent or reduced to such a point that it is not misleading. Incubation over night at about 37° C. and then for 24 hours at room temperature gives better results than other methods of holding described in this paper. Variations in the opacity of the antigen within fairly wide limits have no great influence on the correct interpretation of results. A rapid and satisfactory method of reading tests, based on the clearing of the fluid and manner of the distribution of the agglutinated and nonagglutinated bacteria at the bottom of the tube, is presented."

The significance of partial agglutination reactions for bovine infectious abortion, C. F. Schlotthauer (*Cornell Vet., 20 (1930), No. 4, pp. 363–367*).—In the studies here reported four infected dairy herds, with a total of 188 cows, were observed over a period of two years, agglutination tests being made at intervals of six months. Segregation of infected animals was not attempted. In the entirely negative herd of 75 animals there was a 6.3 per cent incidence of abortion, in the slightly suspicious group of 15 cows 21 per cent aborted,

in the highly suspicious groups 28.5 per cent aborted, and in the positive group of 86 cows and heifers 42.6 per cent aborted. In one herd of 78 cows the incidence of sterility mortality due to infectious abortion was 22 per cent, and that due to other causes was only 4 per cent.

Concerning the value of the agglutination test for Bacillus abortus in the control of genital diseases of cattle, W. L. WILLIAMS (*Cornell Vet., 20 (1930), No. 4, pp. 351–362*).—This is a discussion of the contribution by Lothe previously noted (E. S. R., 62, p. 263).

The effect of age and temperature on the agglutination titer of bovine blood samples using Br. abortus Bang antigen, L. J. POELMA (*Cornell Vet., 20 (1930), No. 3, pp. 295–300*).—In the studies conducted, the details of which are presented in tabular form, bovine blood samples held at room temperature in hot weather for a period of five days often showed a loss in titer when examined by the agglutination test for *Brucella abortus*. Serum samples separated from the blood clot soon after drawing and held at room temperature during hot weather for a period of five days often showed a similar loss in titer when examined by the agglutination test. The loss in titer was less marked in both whole blood and sera samples held at ice box temperature. The drop in titer in the two groups of samples ran nearly parallel when the samples were held at the same temperatures. Hemolysis did not materially interfere when the whole blood samples were refrigerated. It was found that during hot weather it is often inadvisable to test unrefrigerated blood samples over 72 hours old by the tube method.

Comparative sensitivity of common types of antigen, D. W. BAKER and R. C. KLUSSENDORF (*Cornell Vet., 20 (1930), No. 4, pp. 368–370*).—The authors find a live *Brucella abortus* antigen to be the most satisfactory, the results indicating more clear-cut reactions.

Studies in chemotherapy of Bang's disease (bovine infectious abortion), R. GRAHAM and F. THORP, JR. (*Cornell Vet., 20 (1930), No. 4, pp. 325–344*).—The authors here report the results of a series of preliminary tests involving an inquiry into the therapeutic value of certain drugs that are tentatively regarded by certain clinicians as potentially effective. The standards of measuring results in the studies were the agglutinin titer of the blood of treated infected animals as well as the bacteriostatic effect of the dyes on *Brucella suis* in vitro. Bacteriologic examinations of the tissues of treated animals were also resorted to.

Acriflavine, Trypacrin "A," tryparsamide, and colloidal carbon administered intravenously, as well as an iodine preparation known as alkali hypoiodite given intramuscularly, to cows, failed to alter appreciably the blood serum agglutinin titer of Bang infected cows. The bacteriostatic action of acriflavine for *B. suis* in vitro was demonstrated. A milder inhibitory effect on *B. suis* was observed by Trypacrin "A." Tryparsamide, alkali hypoiodite, and colloidal carbon were not bacteriostatic for *B. suis* in the dilutions employed. The bacteriostatic effect of acriflavine and Trypacrin "A" in vitro is not correlated in vivo against natural infection of Bang's disease as judged by the agglutinin titer of the blood serum.

The details of the work are given in 15 tables that are appended.

The chemotherapy of infectious abortion with trypan blue [trans. title], SCHUBERT (*Deut. Tierärztl. Wchnschr., 37 (1929), No. 44, pp. 693, 694; abs. in Cornell Vet., 20 (1930), No. 4, pp. 399, 400*).—The results obtained from the use of trypan blue in 27 herds heavily affected with abortion, in which 463 cows were treated, were surprisingly good. The disease was completely eradicated from 22 herds following the trypan blue treatment, with the remaining 5 herds

treated showing occasional isolated cases. Among the 463 animals treated there was an abortion rate of 3.6 per cent, the other 96.4 per cent carrying their calves to term. The treatment consisted of three intramuscular injections each of a fresh solution prepared by dissolving 1 gm. of trypan blue in 100 cc. of warm, sterile water. The second injection is made three weeks after the first, and the third two months after the second.

Formaldehyde and mercurochrome in the treatment of rabbits infected with Brucella abortus, R. Gwatkin (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 6, pp. 743–745*).—In the experiments conducted 5 cc. of a 3 per cent solution of formalin per 3,000 gm. of body weight appeared to be the maximum intravenous dosage for rabbits. "There were no indications that the formalin had any beneficial action in controlling *B. abortus* infection as judged by the agglutinin titer. Intravenous injection of a 1 per cent solution of mercurochrome at the rate of 0.4 cc. per 1,000 gm. of body weight produced no ill effects, but had no apparent influence on the infection as judged by the agglutinin titer. Rabbits were not so suitable for testing purposes as guinea pigs, as the organism was not recovered from them on culture nor were there any lesions. A culture had been employed that produced well-marked lesions in guinea pigs by the same mode of infection."

Purchased vs. home-grown replacements: Their relative values in building up herds free from Brucella infection, J. G. Hardenbergh (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 629–635*).—It is concluded that there is a marked balance in favor of the home-grown heifers, both with respect to reactions after calving and to subsequent retests while in the herd.

Bang disease, M. F. Barnes (*Holstein Breeder and Dairyman, 9 (1930), No. 2, pp. 43–46, fig. 1; also in Cornell Vet., 20 (1930), No. 3, pp. 249–262*).—This summarized account of the disease includes a discussion of the control work that has been in progress in Pennsylvania since 1920 under the so-called Pennsylvania plan. Under this voluntary plan, which has been successfully carried out in the State for 10 years, reactors to the agglutination test are isolated and kept separate from susceptible animals. During the course of the work testing has been conducted in over 3,000 herds, of which more than 1,000 are operating under the plan and 270 have been certified as free from the disease.

Boric acid for the preservation of milk naturally infected with Brucella abortus, J. Traum and B. S. Henry (*Jour. Infect. Diseases, 47 (1930), No. 5, pp. 380–383*).—In work at the California Experiment Station boric acid in 1 per cent concentration was found to be a convenient, efficient, and safe preservative for milk that is to be injected into guinea pigs to determine the presence or absence of *B. abortus.*

Types of Brucella in one hundred twenty-nine cases of undulant fever, W. N. Plastridge and J. G. McAlpine (*Jour. Infect. Diseases, 47 (1930), No. 6, pp. 478–484*).—In work at the Connecticut Storrs Experiment Station 129 strains of the genus Brucella isolated from cases of undulant fever in the United States and Europe were classified by Huddleson's dye plate method and by their ability to utilize dextrose. Sixty-three of these strains were found to be of the bovine type of *B. abortus* and the remaining 66 of the porcine type. The average, minimum, and maximum amounts of available (1 per cent) dextrose utilized by the two types of *B. abortus* of human origin are as follows: Bovine type 0.88, 0, and 3 per cent, respectively; porcine type 10, 3.3, and 18.2 per cent, respectively. The results obtained by Huddleson's dye plate method were in close agreement with those obtained by the dextrose utilization method.

The association of Bacterium abortus Bang with hygroma of the knee of cattle, W. L. Boyd, A. L. Delez, and C. P. Fitch (*Cornell Vet.*, *20* (*1930*), *No. 3*, *pp. 263–269*, *figs. 2*).—In investigations conducted at the Minnesota Experiment Station *B. abortus* was isolated from the contents of carpal hygromata in two cows. The organism was secured by direct culture and by inoculation into guinea pigs. Attempts at isolation of the organism from two cows affected with acute gonitis failed. The data thus far accumulated indicate that *B. abortus* is an associated etiological factor in carpal hygromata of the cow. This is thought to be the first record of its isolation from this affection.

On the biology of the fourth stage larva of Oxyuris equi (Schrank), R. Wetzel (*Jour. Parasitol.*, *17* (*1930*), *No. 2*, *pp. 95–97*, *pl. 1*).—It was found that the fourth stage larvae of *O. equi* attach themselves to the mucous membrane of the colon by drawing a portion of the stratum glandulare into the anterior part of the esophagus, which for this purpose has adapted itself to the shape and function of a mouth capsule. This results in a mechanical *destruction of the superficial layers of the mucosa, the cells of which, together* with tissue juice, are probably the actual food of the larvae.

Psittacosis in Argentina [trans. title], E. Barros (*Rev. Asoc. Méd. Argentina*, *43* (*1930*), *No. 289–290*, *pp. 17–62*, *figs. 2*).—This contribution which was presented at the Seventh National Congress of the Argentina Medical Association in November, 1929, deals with the history of the occurrence of psittacosis, epidemics in Argentina, symptoms in man, differential diagnosis, pathology, psittacosis in animals, prophylaxis and treatment, a discussion of cases in Argentina, and technical and theoretical problems. A bibliography of eight pages is included.

An experimental study of the pathogenic properties of Streptococcus alpha isolated from the genital organs of cattle, R. Graham and F. Thorp, Jr. (*Cornell Vet.*, *20* (*1930*), *No. 3*, *pp. 270–284*, *figs. 4*).—The authors isolated *S. alpha* from aborted bovine fetuses, male genital organs, semen, and vaginal discharges in cases of abortions in two herds in which *Brucella abortus* could not be demonstrated. "The genitalia of cows and bulls from which cultures of *S. alpha* were obtained gave negative reactions to Brucella agglutinins. Other cows yielding positive Streptococcus cultures proved to be infected with Bang's disease as judged by the agglutination test. *S. alpha* strains isolated from the bovine genital tract proved but slightly pathogenic for white mice. Specific *S. alpha* agglutinins in artificially inoculated animals were not demonstrated. Nonspecific agglutinins in the blood of other animals were encountered."

The third stage larva of Strongylus equinus, E. L. Taylor (*Ann. Trop. Med. and Parasitol.*, *24* (*1930*), *No. 4*, *pp. 545–561*, *figs. 6*).—This is an account of what is considered the third stage larva of *S. equinus*, which has been found in the liver, the wall of the first part of the large colon, and some lymphatic glands of the experimentally infected guinea pigs. In this host the larvae do not penetrate the peritoneum but reach the liver by the blood stream and the lymphatic glands by the lymphatic vessels.

Sudan grass as a photosensitizing agent causing dermatitis in sheep (fagopyrism, white skin disease), J. A. Howarth (*North Amer. Vet.*, *12* (*1931*), *No. 1*, *pp. 29–33*, *figs. 5*).—A brief description is given of this affection in sheep grazing on Sudan grass, many cases of food sensitization, probably allied to fagopyrism, having been met with in California in the past 2.5 years.

Observations on Trypanosoma rhodesiense in sheep and goats, J. F. Corson (*Jour. Trop. Med. and Hyg.* [*London*], *33* (*1930*), *No. 24*, *pp. 385–389*).—The author reports that "the characters by which *T. rhodesiense* is distin-

guished from *T. gambiense*, such as high infectivity and virulence for laboratory animals, rapid multiplication, and the occurrence of numerous posterior-nuclear forms in the blood of these animals, were preserved by the trypanosome during maintenance for six months in sheep and goats. The trypanosomes showed also, on the whole, a somewhat greater susceptibility to the action of normal human serum, when tested in subinoculated white rats, than was shown when rats were directly infected from man.

"So far as can be judged from these direct passage experiments, a herd of sheep and goats can remain infected with *T. rhodesiense* for at least several months and possibly throughout its existence as a herd, where opportunities occur for the transmission of the infection. The animals are infective throughout the course of the disease, which is short and acute."

The etiology of "louping-ill," W. A. Pool, A. Brownlee, and D. R. Wilson (*Jour. Compar. Path. and Ther.*, *43* (*1930*), *No. 4*, *pp. 253–290*, *figs. 2*).—In experimental work conducted "louping ill" was produced in sheep and pigs, but no evidence was found of the existence of a bacterial agent capable of causing it. Infection does not occur from contact, the infective agent being present in certain tissues of affected sheep. It is thought that at some stage of the disease the infective agent is constantly present in the central nervous system of affected sheep, it being usually but not constantly in the mesenteric and popliteal lymphatic glands and spleen. It is usually present in the blood at some stage of the infection, but may be absent throughout the illness. Infection has been produced by intracerebral, intraspinal, intrasciatic, intraocular, intravenous, and subcutaneous inoculation, and by supra-ocular instillation, but not by intramuscular, intradermal, or endermic inoculation, intranasal instillation, or by administration per os.

The infective agent is viable in 50 per cent glycerol for at least 82 days. It resisted exposure for 3 hours at 20° C. to 1 per cent phenol, 0.005 per cent sodium hydrate, and 0.001 per cent copper sulfate. It was destroyed by similar exposure to 0.5 per cent formol, 0.05 per cent sodium hydrate, and 0.01 per cent copper sulfate. It resisted exposure for 1 minute to a temperature of 60°, and was destroyed by exposure for 5 minutes or more.

The experiments carried out have not shown that any animals other than sheep and pigs are susceptible to the infection.

Porcine osteomyelitis, pyemic arthritis, and pyemic bursitis associated with Brucella suis Traum, W. A. James and R. Graham (*Jour. Amer. Vet. Assoc.*, *77* (*1930*), *No. 6*, *pp. 774–782*, *figs. 7*).—The authors record observations made of a disease that appeared in a herd of swine in Illinois over a period of several years. The symptoms in several infected animals combined with the lesions and bacteriological findings in two animals suggested the presence of *B. suis* as the cause of lameness and stiffness in the herd. At autopsy, lesions of pyemic arthritis, pyemic bursitis, and osteomyelitis were detected. Guinea pigs injected with the necrotic bone material developed lesions somewhat characteristic of Bang bacillus infection in the liver and spleen. The blood serum of the inoculated guinea pigs agglutinated stock Brucella cultures, while direct isolations were made from the inoculated guinea pigs following inoculation and at time of autopsy.

Studies on hog cholera virus in vitro, R. Graham and F. Thorp, Jr. (*Cornell Vet.*, *20* (*1930*), *No. 3*, *pp. 285–288*).—In the studies here reported, in which a modification of Degkwitz's method of cultivating human measles virus was employed, negative results were obtained in an attempt to cultivate the filtrable virus of hog cholera. The culture filtrate injected subcutaneously proved nonantigenic, as inoculated pigs later proved susceptible to hog cholera.

Non-specific skin reactions in pigs to the injection of trichina extracts, B. SCHWARTZ (*Jour. Parasitol., 17 (1930), No. 2, p. 114*).—Of 466 abattoir pigs, not artificially infected, receiving subcutaneous injections of pulverized trichina larvae extracted in Coca's solution, 9 gave marked reactions, indistinguishable from the most pronounced reactions obtained in experimentally trichina-infected pigs.

Nematode parasites of pigs in Bengal, H. P. A. MAPLESTONE (*Rec. Indian Mus., 32 (1930), No. 2, pp. 77–105, figs. 37*).—An account of the helminths collected from the alimentary tract of pigs slaughtered at the Calcutta abattoirs, of which three species are described as new.

Experimental studies of the treatment of surra, F. H. K. REYNOLDS, J. S. SIMMONS, and J. H. ST. JOHN (*Philippine Jour. Sci., 43 (1930), No. 4, pp. 627–651, figs. 9*).—The authors find that rats infected with *Trypanosoma evansi* may be cured by alternating injections of tartar emetic and etharsanol in doses smaller than the amount required when the latter drug is used alone. The use of larger amounts of these drugs in the treatment of infected horses and mules gave results which are considered to be of sufficient promise to warrant further study.

The treatment of surra (trypanosomiasis) of equines in India by intravenous-intrathecal injections of Bayer 205, A. J. WILLIAMS (*Jour. Roy. Army Vet. Corps, 1 (1929), No. 1, pp. 37–42*).—This is a report of work conducted, in the course of which the therapeutic effects of Bayer 205, tartar emetic, bismuth compounds, and tryparsamide were investigated on artificially infected equines and naturally contracted infections. It was found that the therapeutic effect of Bayer 205 far surpassed that of other medicaments, and that relapses occurred in cases where the treatment was confined to intravenous medication but not in cases treated by the confined intravenous-intrathecal medication.

In experiments carried out at Muktesar from 1925 to 1927, animals treated with Bayer 205 by the combined method remained negative throughout the observation period, extending up to 1 year. Details of the routine treatment recommended are given. Of 52 horses and 24 mules treated 47 and 21, respectively, were cured, or a percentage of 90.

The use of tetanus anatoxin in the protection of horses against infection by Chlostridium tetani, F. H. K. REYNOLDS, J. S. SIMMONS, and J. H. ST. JOHN (*Philippine Jour. Sci., 43 (1930), No. 4, pp. 611–625*).—Immunization of guinea pigs against tetanus infection was easily accomplished by the injection of anatoxin prepared according to the technic of Ramon. The precipitating, drying, and pulverizing of anatoxin resulted in a complete loss of the immunizing properties.

"The results of experimental investigation of the protection afforded horses and mules by the injection of anatoxin were conflicting. In the first series, two of three animals were protected for a period of at least one month, one of three animals was protected for a period of about six months, while all of four animals tested one year after the administration of anatoxin were protected and one developed slight symptoms of infection but recovered. In the second series, seven horses died following the injection of tetanus spores, five and one-half months after the administration of anatoxin."

An organism simulating the Preisz-Nocard bacillus, Z. MORCOS (*Vet. Rec., 11 (1931), No. 2, pp. 34–36, figs. 5*).—A bacillus simulating the Preisz-Nocard bacillus was isolated by the author from equine skin ulcers, but a vaccine prepared from it and the ulcer-associating bacteria was found in the few cases attempted to be of no value.

Critical tests of butylidene chloride for equine parasites, W. H. Wright (*Jour. Parasitol., 17 (1930), No. 2, pp. 117, 118*).—"Normal butylidene chloride, given to four animals at a dose rate of 0.207 to 0.317 cc. per kilogram of body weight and followed in 5 hours by 960 cc. of raw linseed oil for a 1,000-lb. animal, resulted in efficacies of 50 per cent, 94 per cent, 100 per cent, and 100 per cent, respectively, against *Strongylus* spp. and 100 per cent for *Trichonema* spp. in all four animals. The anthelmintic removed all of the *Poteriostomum* spp. present in the three animals harboring these parasites. The treatment was relatively ineffective against *Gastrophilus* spp.; other species of parasites were not present in a sufficient number of test animals to warrant final conclusions. The efficacy of *n*-butylidene chloride was considerably lowered in other tests where the drug was administered in raw linseed oil or where followed by aloes or by a castor oil-mineral oil mixture. Liver lesions in treated animals were confined to cloudy swelling with some fatty degeneration, but no central necrosis. The drug produced no kidney lesions. Normal butylidene chloride was well tolerated and produced no gross pathological alterations."

Status of the vaccination of dogs against distemper, N. J. Pyle (*North Amer. Vet., 11 (1930), No. 9, pp. 40–46*).—The author reports that the efficiency of the Laidlaw-Dunkin (E. S. R., 59, p. 676) prophylactic for canine distemper has been definitely proved. While there have been some failures of the treatment to stimulate a complete or solid immunity against the disease, such cases are in the extreme minority.

Recent advances in the prophylaxis and treatment of canine distemper, F. W. Wood (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 569–578*).—A summary of the results obtained in the field has led the author to conclude that for the present, at least, the canine distemper virus is too unstable a product for general distribution. The vaccine antigen is considered to be a satisfactory and safe product for general use, but the immunity is not of long duration.

Chloroform-treated rabies vaccine, R. A. Kelser (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 595–603*).—The author has found a chloroform-treated rabies vaccine containing 33⅓ per cent brain tissue to be a very efficacious immunizing agent against the disease. A single dose of 5 cc. for dogs should prove effective against natural infection. It is concluded that the active principle of this vaccine is something other than dead virus. It is possibly a cellular principle resulting from the reaction between the virus and tissue cells, or it may be a particular "stage" of the virus which occurs only in the tissue cells.

Hexylresorcinol in canine ascariasis, P. D. Lamson, H. W. Brown, and C. B. Ward (*North Amer. Vet., 12 (1931), No. 1, pp. 17–21*).—In the experiments conducted, the details of which are presented in tabular form, hexylresorcinol was found to be an effective, safe ascaricide for dogs. Practically 100 per cent of the ascarids can be removed from dogs properly treated with a single administration of from 0.6 to 1 gm. of this drug. No serious complications are known to occur from its use, and no precautions are necessary in its administration except to insure that no food is taken for some hours previous to and after its administration.

A new nematode parasitic in the eyes of dogs in the United States, E. W. Price (*Jour. Parasitol., 17 (1930), No. 2, pp. 112, 113*).—Under the name *Thelazia californiensis* the author describes a new nematode taken from two rather widely separated sections of California, where it occurred in the eyes of dogs.

Bact. abortus infection in the fowl, H. L. Gilman and E. L. Brunett (*Cornell Vet., 20 (1930), No. 4, pp. 371–377*).—The results of tests on the commercial

flocks and birds sent in to the New York State Veterinary College for routine diagnosis show that there are some birds in New York State naturally infected with *Bacterium abortus*, but so far there is no evidence that it is a very serious or widespread disease.

Experimentally the authors were able to produce a positive blood titer and recover *B. abortus* from birds injected subcutaneously and intraperitoneally, fed naturally infected milk, and fed the organism on the mash. In general, the blood titer was not very high or persistent except in those birds injected with the organism. Likewise, the infection, as demonstrated by the authors' ability to recover the organism from the birds by cultural methods, tends to die out within a month or six weeks. They have, however, been able to recover the organism from a pullet at 98 days and from one cock at 138 days.

It was noted that the birds seemed more susceptible to a strain of the organism recovered from an avian source. While the authors were unable to produce an increased blood titer and infection by feeding naturally infected milk having a high agglutinin content, there was no evidence of direct agglutinin absorption from the milk, such as takes place in the calf. This was shown by the fact that the blood titer did not start to rise until the twentieth day after the feeding of the milk was commenced. There appeared to be very little impairment of the health of the birds and little or no evidence of disturbance of the function of egg production.

Clostridium welchii infection in the domesticated fowl, K. W. NIEMANN (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 604–606*).—The author reports having isolated *C. welchii*, type 2 of Bergey, from two of six birds from a badly parasitized flock in Nevada. The organism was isolated, identified, caused to reproduce the condition by inoculation, and recovered from the isolated bird in establishing the etiology of the infection. The infection appeared to enter through the intestinal tract. The study indicates that the infection of this organism in the domesticated fowl is not a specific disease entity but a sporadic infection that may occur in a heavily parasitized flock.

***The nature of fowl-pox virus as indicated by its reaction to treatment* with potassium hydroxide and other chemicals**, E. W. GOODPASTURE and A. M. WOODRUFF (*Amer. Jour. Path., 6 (1930), No. 6, pp. 699–712, pls. 2*).—The authors find that fowl pox virus in suspensions of finely divided material can be rendered inactive after a period of from 4 to 24 hours in 1 per cent potassium hydroxide. In the form of inclusion bodies, however, the virus was infectious, in diminishing strength, after treatment with potassium hydroxide for as long as 5 days. No evidence was found of the existence of a nucleoproteid toxin, such as that described by F. Sanfelice,[1] either in scabs of the fowl pox lesion or in digested inclusion bodies. The destructive action of 1 per cent potassium hydroxide on normal epithelial cells of the chick was demonstrated, as was the presence of Borrel bodies in inclusions which proved infectious after having remained for 24 hours in 1 per cent potassium hydroxide.

***The relation of the virus of fowl-pox to the specific cellular inclusions* of the disease**, C. E. WOODRUFF and E. W. GOODPASTURE (*Amer. Jour. Path., 6 (1930), No. 6, pp. 713–720, pls. 2*).—It was found that inclusion bodies of fowl pox may be broken up by using the surface tension of a drying film of water. The stained smear of an inclusion body thus disrupted was shown to contain as many as 20,000 Borrel bodies—minute coccoid structures uniform in size and shape. Multiple inoculations were made from the smears of isolated and ruptured inclusion bodies with as many as six inoculations from a single in-

[1] Ztschr. Hyg. u. Infektionskrank., 76 (1913), pp. 257–281, pl. 1.

clusion resulting successfully. Control inoculations were all negative. The lipoid component of the inclusion bodies is noninfectious. Aside from this lipoid, the Borrel bodies form the major constituent of the inclusions and are judged to represent the actual virus of fowl pox.

Fowl pox (diphtheria of fowl) and its control [trans. title], W. Zwick (*Deut. Tierärztl. Wchnschr., 38 (1930), No. 29, pp. 449–453; abs. in Vet. Rec., 10 (1930), No. 45, p. 1019*).—A summary of information, with particular attention to control measures.

A note on avian laryngotracheitis, R. Graham, F. Thorp, Jr., and W. A. James (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 587–594*).—This is a summary of information on laryngotracheitis or infectious bronchitis of fowl based on observations in Illinois.

The virus of laryngotracheitis of fowls, J. R. Beach (*Science, 72 (1930), No. 1877, pp. 633, 634*).—The finding of a filtrable virus in the inflammatory exudate contained in the tracheas of infected fowls is reported. The virus was present in six of seven filtrates from the exudate in filtrations made through five different Berkefeld V filters. Of five filtrations made through Berkefeld N filters, three proved infectious and two noninfectious. As yet no infection has been secured from material passed through Seitz filters. The incubation period of the filtrate inoculations has been the same as that of inoculations of nonfiltered suspensions of the exudate.

A case of leukemia in the fowl, M. W. Emmel and H. J. Stafseth (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 640, 641, fig. 1*).—A report of a case observed in the course of work at the Michigan Experiment Station.

Paradysentery in young chicks, C. A. McGaughey (*Jour. Compar. Path. and Ther., 43 (1930), No. 4, pp. 308, 309*).—The author reports briefly upon a disease of young chicks resembling bacillary white diarrhea which presents several unusual features. The causative organism appears to be one of the group described as dysenteroid or paradysentery bacteria. This group includes members of the colityphoid group which belong somewhere between *B(acillus) coli* and *B. dysenteriae*.

"The striking features of the outbreak were its causation by an organism of the paradysentery group, its resemblance to bacillary white diarrhea, its apparent transmission through the egg, and its limitation to chicks hatched from eggs from one source. This naturally suggests that adult carriers occur. The organism was recovered from the yolk residue in a bird 2.5 months old. It would appear to have a lower invasive power in a flock than has *B[acterium] pullorum*."

The use of modified antigens for the prevention of cloudy reactions in testing avian blood sera for pullorum disease, W. L. Bleecker and S. J. Schilling (*Poultry Sci., 9 (1930), No. 6, pp. 363–370*).—In continuation of the work with modified antigens at the Arkansas Experiment Station in the search for one that will entirely prevent the cloudy reactions often encountered in testing avian blood serum, the conclusions are the same as those for the preceding year (E. S. R., 62, p. 775). An antigen containing 0.04 per cent sodium hydroxide appeared to be the most efficient in preventing cloudy reactions. The antigen containing 5 per cent sodium chloride appeared to be of little value, while that containing 1.8 per cent was second only to that containing 0.04 per cent sodium hydroxide. The antigen containing 1.8 per cent sodium chloride plus 0.04 per cent sodium hydroxide did not appear as valuable as the antigen containing but one of the two.

The effect of chemicals in the control of poultry diseases.—III, The use of metaphen as an internal disinfectant, J. C. Weldin and H. J. Weaver

(*Poultry Sci., 9 (1930), No. 6, pp. 371–376*).—In this third contribution from the Rhode Island Experiment Station (E. S. R., 60, p. 77), the authors report that metaphen was practically nontoxic for baby chicks when administered orally in a 1:500 dilution. It failed, however, to reduce the mortality of chicks artificially or naturally infected with *Salmonella pullorum* to any marked degree, and did not appear to have any germicidal action in the alimentary tract. It did act as an efficient disinfectant of the drinking water in a 1:20,000 dilution.

Avian tuberculosis following artificial inoculation of eggs, F. THORP, JR., and R. GRAHAM (*North Amer. Vet., 11 (1930), No. 12, pp. 34–38, figs. 4*).—In experiments conducted eggs artificially inoculated with the avian type of the tubercle bacillus showed a lower hatchability and a higher embryo mortality than uninoculated control eggs. Rabbits fed dead chick embryos from eggs inoculated with the avian type developed lesions of tuberculosis, while direct cultures from dead embryos proved positive.

"Fifty-two or 18.2 per cent of the 284 artificially inoculated eggs hatched, suggesting the survival of the artificially exposed embryo, while 29 of the 52 or 55.7 per cent of the egg inoculated chicks showed gross lesions of tuberculosis on or before the fifth month. During the same period of time (5 months) 15 per cent of the control chicks contracted the disease through direct association with the egg inoculated chicks. Many Illinois flocks, some of which were culled by State inspectors in supplying eggs to State accredited hatcheries, showed an average of from 1.56 to 3.91 tuberculous infections in the pullets and from 6.46 per cent to 18.28 per cent in the mature fowls, as judged by the tuberculin test. The percentage of flock infection in the two groups referred to of 68 and 129 flocks ranged from 57.3 to 80.4 per cent."

A list is given of 10 references to the literature.

Recent progress in duck disease studies, P. A. SHAW (*Jour. Amer. Vet. Med. Assoc., 77 (1930), No. 5, pp. 561–568*).—This is a progress report of work under way in California (E. S. R., 64, p. 179).

The incidence, pathogenicity, and transmission of Leucocytozoon anatis of ducks, E. C. O'ROKE (*Jour. Parasitol., 17 (1930), No. 2, p. 112*).—In observations made by the author in Michigan of *L. anatis* it apparently was not harmful to adult ducks but was pathogenic to ducklings, the mortality being 35 per cent in the cases studied.

Pullorum disease in a young turkey, H. M. DE VOLT and A. GOW (*Cornell Vet., 20 (1930), No. 4, pp. 398, 399*).—The authors record the occurrence of pullorum disease in a poult in a flock in the eastern part of Maryland in which losses had occurred intermittently.

Pullorum disease in the mature turkey, E. L. BRUNETT (*Poultry Sci., 9 (1930), No. 6, pp. 356–360*).—The autopsy and bacterial examination of a flock of mammoth bronze turkeys, both old and young, resulted in the finding of lesions quite similar to those occurring in the chicken, from which *Bacterium pullorum* was isolated. Upon application of the agglutination test for this organism, eight birds reacted. The importance of pullorum infection in turkeys where eradication of the disease from flocks of chickens is under way is emphasized by the author.

Trichomonas diversa n. sp. and its association with a disease of turkeys, F. VOLKMAR (*Jour. Parasitol., 17 (1930), No. 2, pp. 85–89, fig. 1*).—Under the name *T. diversa* the author describes a new flagellate which has been observed exclusively in the lumen of the upper digestive tract of turkeys. It has invariably been found associated with peculiar lesions of the mucous membrane of the upper digestive tract of these turkeys.

Epizootic fox encephalitis.—I, General description, R. G. GREEN, N. R. ZIEGLER, B. B. GREEN, and E. T. DEWEY (*Amer. Jour. Hyg., 12 (1930), No. 1, pp. 109–129, figs. 13*).—This is a report of studies of a common disease of silver or red fox in captivity caused by a filtrable virus which invades the blood and may be demonstrated in various tissues to which the name epizootic fox encephalitis has been applied. The symptoms, physical findings, necropsy findings, microscopic pathology, etiology, course, morbidity, susceptibility and mortality, distribution of virus, artificial transmission, and immunity are considered.

AGRICULTURAL ENGINEERING

Report of proceedings of the first session of the Southwest Conference on Soil and Water Conservation, A. D. JACKSON (*Southwest Conf. Soil and Water Conserv. Proc., 1 (1929), pp. 64, pl. 1*).—The text of the proceedings of the first conference, held at College Station, Tex., in June, 1929, is given.

A discharge diagram for uniform flow in open channels, M. BLANCHARD (*Amer. Soc. Civ. Engin. Proc., 57 (1931), No. 1, pp. 113–118, figs. 7*).—This paper presents a diagram of discharge stage and slope or fall relation for uniform flow in open channels. It is based on the Chezy formula wherein, for a constant stage, the discharge varies as the square root of the slope or fall and is designed to give the discharges at any stage for the falls that create the resulting discharges. The development of the diagram is shown by a practical application to a series of discharge measurements made in 1914–1916 on the Chicago Sanitary District Canal with regulated flows in a uniform rock section.

Basic principles of concrete making, F. R. MCMILLAN (*New York and London: McGraw-Hill Book Co., 1929, pp. XV+99, figs. 32*).—Following an introduction by F. E. Schmitt, this book presents the underlying principles of concrete mixtures. It contains chapters on the philosophy of concrete mixtures, combined and uncombined water, compressive strength, water-tightness and other properties, combining aggregates with cement paste, design of concrete mixtures, selection of curing period and water-cement ratio, selection of aggregates, and importance of proper construction methods.

Timber design and construction, H. S. JACOBY and R. P. DAVIS (*New York: John Wiley & Sons; London: Chapman & Hall, 1930, 2. ed.,* [*rev.*], *pp. XII+334, pls. 10, figs. 91*).—This book contains the digested results of extensive experimental investigations and research on fastenings used in framing, including bolts, nuts, washers, spikes, nails, screws, dowels, pins, keys, and metal straps and plates. In the description of joints in framing, the principal types of tension joints are illustrated, and other types such as lap and scarf, bearing, dovetail, mortise and tenon, and step joints, angle blocks, and metal shoes are discussed. Other chapters deal with wooden beams, wooden roof trusses, examples of practice used in frame construction, and commercial grades, timber tests, and unit stresses.

Principles of structure for apple storage houses, J. B. KELLEY (*Ky. State Hort. Soc. Trans., 1928, pp. 153–165, fig. 1*).—In a contribution from the Kentucky Experiment Station, a discussion is presented of the fundamental principles involved in the design of an air-cooled apple storage house for Kentucky conditions. Special attention is devoted to the control of temperature, humidity, and ventilation and the design of insulation. A list of references to reports bearing on the subject is included.

Tests of farm machines, J. G. TAGGART (*Canada Expt. Farms, Swift Current (Sask.) Sta. Rpt. Supt. 1928, pp. 22–32, figs. 8*).—Summer fallowing experiments by different methods showed that the gang plow and the one-way disk

are equally efficient in destroying the early growth of weeds on summer-fallow land and in putting the land in such shape that the duck-foot cultivator can perform subsequent operations without undue difficulty. As the one-way disk does this work at almost half the cost of plowing, it is evident that this implement has a very definite and useful place on land not too heavy and sticky for its successful operation.

Combine tests in wheat showed that the swathed grain, and particularly that which was swathed at the normal time of binder harvesting, did not dry out any earlier than did either the standing grain or grain in the shock. Good results were obtained with the header barge.

In tests of the swather and combine in oats, it was found that the swather and pick-up left 12.36 lbs. of grain per acre on the ground and the straight combine 57.2 lbs. The greater portion of the swather loss was occasioned by one swath falling partly in a dead furrow in which the pick-up was operated with difficulty. Over the remainder of the swathed portion of the field the loss was almost nonexistent. This would indicate that oats sustain a much greater loss from shelling while waiting for the straight combine than does Marquis wheat, barley, and fall rye.

RURAL ECONOMICS AND SOCIOLOGY

Annals of the International Commission of Agriculture (*Ann. Comn. Internatl. Agr., 1930, pp. [1]+74*).—Included are the proceedings of the fourteenth congress held at Bucharest on June 9, 1929, the resolution adopted, the constitution and regulations of the special committee on agricultural cooperation, and letters to the International Labor Office regarding the prevention of accidents in agriculture and a census of enterprises and population, to the associations affiliated with the commission relative to the economic organization of the League of Nations, and to the agricultural organizations affiliated with the commission regarding the creation of a commercial information service.

First annual report of the Federal Farm Board, A. Legge (*Fed. Farm Bd. Ann. Rpt., 1 (1930), pp. IV+75*).—This report covers the operations of the board from July 15, 1929, to June 30, 1930. The organization, personnel, and general attitude of the board are described. The general policies in developing cooperative marketing associations, the development of such associations for different agricultural products, the operations and results in cotton, wheat, and butter stabilization, the loans from the revolving fund, and other phases of the board's activities are discussed.

Appendixes include the Agricultural Marketing Act of June 15, 1929, and tables relating to the loan operations of the board.

The agricultural outlook for the Southern States, 1930–31 (*U. S. Dept. Agr., Misc. Pub. 102 (1930), pp. 56*).—"This report is designed to present, in readily available form, for the principal southern farm products, the significant facts relating to supply, demand, and prices that should be considered by southern farmers when planning their operations for the next crop season." It also discusses the credit outlook, and includes a brief long-time outlook for agriculture in the Southern States. It was prepared by the staff of the Bureau of Agricultural Economics, assisted by the Extension Service of the Department, the Federal Farm Board, and representatives of the State agricultural colleges, experiment stations, and extension services of Virginia, North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, Arkansas, Tennessee, and Oklahoma.

An agricultural policy and program for New Jersey (*New Jersey Stas. Circ. 225 (1930), pp. 125*).—Included are the following articles: The Agricultural Situation in New Jersey, by H. J. Baker (pp. 5–7); General Economic Factors, by W. F. Knowles (pp. 7–18); The Soils of New Jersey, by H. R. Cox (pp. 18–22); Field Crops and Pastures, by H. R. Cox (pp. 22–37); Engineering's Course in the Agricultural Situation, by E. R. Gross (pp. 37–43); Dairying, by E. J. Perry and R. G. Connelly (pp. 43–53); The Poultry Industry, by L. M. Black (pp. 53–61); Livestock Production, by F. G. Helyar (pp. 61–66); Vegetable Growing, by C. H. Nissley (pp. 66–73); A Preliminary Statement of the Fruit Situation in New Jersey, by A. J. Farley (pp. 74–83); Ornamental Horticulture, by C. H. Connors (pp. 83–85); Beekeeping, by R. Hutson (pp. 85, 86); Forestry, by C. P. Wilber and E. L. Scovell (pp. 86–95); Marketing of New Jersey Farm Products, by W. W. Oley (pp. 95–109); and A Home Economics Program, by M. Butters (pp. 109–114).

Brief statements are also included regarding the organization, membership, and purposes of the several State departments, institutions, and associations in the State interested in agriculture.

Systems of farming in northwestern Minnesota, L. F. Garey and F. F. Elliott (*Minnesota Sta. Bul. 268 (1930), pp. 20, figs. 3*).—This bulletin is a supplement to that previously noted (E. R. S., 62, p. 677). It was prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics, and applies to areas 6 and 7 of the previous study. The shifts in crop and livestock production, 1879–1924, the typical farm organizations in 1925 in the areas, and the ways in which the information given may be helpful in determining suitable farming systems are discussed.

An economic study of factors affecting farm organization and power utilization of sugar cane farms, 1929, G. H. Reuss (*Louisiana Stas. Bul. 215 (1930), pp. 78, figs. 18*).—This report, made in cooperation with the U. S. Department of Agriculture, is based on detailed information for 1929 obtained by a survey made in February, 1930, of 18 farms of less than 100 acres growing cane for the mill, 21 farms of 100 to 199.9 acres, 18 farms of 200 to 299.9 acres, and 17 farms of 300 acres or more. Data regarding costs and organization were also obtained from 15 large plantations. The development and status of the industry in Louisiana, labor and power requirements, machinery and equipment utilization, labor and power distribution on farms of different sizes, yields, and crop and livestock organization are discussed. The operating efficiency of various sized units and tractor, mule, and cane loader costs are analyzed.

As compared with 1913, the prices of sugar, rice, and corn were found to be lower than those of cotton, sweetpotatoes, potatoes, veal, and beef. Cotton, corn, sweetpotatoes, potatoes, and truck crops when included in cane farm crop organization lend themselves to the efficient utilization of machinery. Specialized machinery is required for rice. Under existing prices, yields of cane will not defray costs of production. On plantations having a large proportion of black land or not having ready access to a sugarhouse, there is a possibility of profitably increasing the amount of livestock. With a crop system of corn and cane, labor and power requirements are high in the early spring and during harvest, but can be shifted somewhat by regulating the time of planting cane.

Size of unit operated did not affect greatly the man labor and mule use requirements of the various crops. Soil types, plantation layout, and managerial ability of operators caused wide differences in such requirements. Large plantations had an advantage in machinery utilization, crew organization, and purchasing efficiency. Operating costs of inter-row tractors averaged $7.90 per 10-hour day and for straddle-row tractors $11.27 per day. Cost of mule maintenance varied from $161 per head on family sized farms to

$210 on plantations with over 300 acres operated without tractors. Tractor farms worked 20 crop acres per mule and nontractor farms 16 acres. On the average, total power costs were lower on tractor farms. The replacement of mules by tractors is handicapped by the fact that it has not been possible to replace mules during harvest, and that no single size of tractor will efficiently perform all the cultural operations on cane. Field cane loaders on the farms studied were operated at a cost of 13.3 cts. per ton, an amount considerably below hand-loading costs.

Systems of dairy farm management for the Richmond milk producing area, J. L. Maxton, R. S. Kifer, and J. J. Vernon (*Virginia Sta. Bul. 272 (1930), pp. 95, figs. 22*).—This study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is based on detailed records, including farm receipts and expenses, amounts of man labor, horse work, and feed used by different classes of livestock, amounts of man labor, horse work, tractor work, fertilizer, and seed used in growing and harvesting crops, and the production of livestock, livestock products, and crops, obtained from highly specialized farms producing milk for the Richmond market. Records were obtained from 19 farms in 1927, 18 in 1928, and 14 in 1929. Inventories and records of receipts and expenses and of crops and livestock production were obtained from 28 additional farms in 1927, 26 in 1928, and 32 in 1929. Approximately 90 per cent of the farm income of the farms studied was derived from livestock and livestock products, and only 2 per cent from crop sales. An average of 96 per cent of the milk produced was sold.

The natural conditions in the area are described. Tables are included and discussed showing the organization, investments, receipts, expenses, income, operator's earnings, and labor utilization, grouping the farms according to the labor employed; the relation of acres in crops, number of cows, milk production per cow, value of milk per 100 lbs., work units per man, and crop index to operator's earnings; the factors affecting milk production and the cost of production; and the labor and materials used in producing different crops and poultry.

Systems of organization and cropping are outlined for 20-, 40-, and 60-cow dairy farms and comparisons made of estimated returns with the actual organization and returns for similar size farms in 1929. Some of the effects of suggestions made following the analysis of the data obtained in 1927 are described.

The average annual operator's earnings (farm income less interest on investment) for the 3-year period were for 1-man farms $647, 2-man farms $1,237, 3-man farms $1,393, 4-man farms $1,695, and 5-man or larger farms $2,069. The 137 1-year records studied showed 13 farms with operator's earnings from —$1,001 to less than —$3,001, 15 farms with —$1 to —$1,000, 34 farms with 0 to $1,000, 53 farms with $1,001 to $3,000, and 22 farms with $3,001 to over $6,000. One-man farms averaged 17 milch cows and 53 acres of crops. Larger farms did not show a progressive increase in cows or acres cropped proportional to the increase of labor available.

A definite relation was found between operator's earnings and number of cows, production per cow, and acres in crops. Little interrelation was found between the price of milk, measure for efficiency in the use of labor, or the yield of crops.

The rank in importance of farm-raised crops as feed for dairy cattle was found to be silage, alfalfa hay, soybean hay, small grain and legume hay, pasture, soiling crops, and grain. Poultry production, if properly managed, was found to yield good returns in combination with dairy farming.

The study shows that a 20-cow dairy farm would require 1 man with some additional labor and an investment of approximately $16,500, a 40-cow dairy farm 2 or 3 men and an investment of approximately $32,000, and a 60-cow dairy farm 4 or more men and an investment of approximately $48,000. The cropping systems suggested are for a 20-cow farm 10 acres of corn for silage and 5 acres for grain, 10 acres of alfalfa, and 18 acres of small grain mixture; for a 40-cow farm 20 acres of corn for silage, 5 acres of corn for grain, 25 acres of alfalfa, 5 acres of rye for pasture, 20 acres of small grain mixture, and 3 acres of sorghum; and for a 60-cow farm 40 acres of corn for silage, 20 acres of corn for grain, 30 acres of alfalfa, 30 acres of rye for pasture, 30 acres of small grain mixture, and 5 acres of sorghum.

The development of market milk areas in northeastern Ohio, C. G. McBride (*Ohio Sta. Bul. 469 (1930), pp. 43, figs. 12*).—This study was made of the 33 northeastern counties of the State with a view to tracing the economic influences that have shaped the development of market milk. The type of farming and character of milk production, population growth and increase in milk demands, farm milk sales, cheese factory and milk plant sales, and the per capita consumption of milk and cream are discussed. Sources of supply and methods of handling milk in 4 towns and cities of different sizes ranging from 3,000 to 1,000,000 in population were studied over a period of years. The several counties are rated as to market milk possibilities, and the local competition for milk, milk plants as market reserves, and the changes in milk shed boundaries are discussed.

The annual production per cow in 1926–1929 in the 3 crop-reporting districts of the area varied from 5,572 to 6,385 lbs. The number of dairy cows in the area decreased from 144 per 100 people living in towns of 2,500 population and over in 1870 to 19 per 100 urban people in 1920. The average daily milk sales per farm in 1927 were for Pittsburgh country plants 146.8 lbs., Cleveland 157.3 lbs., Akron 147 lbs., and Canton 151 lbs. The average daily sales in November varied from 110.5 to 134.6 lbs. in the 4 markets, being somewhat higher than the average, 115 lbs., which is considered the most reliable norm of fall sales for the area. Farm sales were found to increase in territory changing from Swiss cheese to market milk production. The daily per capita consumption of fresh milk and cream in Akron and Canton was found to be only approximately 0.75 lb., while for a safe margin the potential supply of a city should be 1 lb. in the period of shortest production. The removal of cattle as the result of area testing for tuberculosis in 1927–1929 did not greatly affect milk production, as at no time was the number of cattle producing milk affected as much as 3 per cent.

Cooperative marketing of dairy products, H. G. Anderson and A. H. Benton (*North Dakota Sta. Bul. 238 (1930), pp. 115, figs. 24*).—The purpose of this bulletin is to furnish the basis for an appraisal of the relative merits of cooperative institutions marketing North Dakota dairy products. Data were obtained regarding 33 of the approximately 40 farmers' cooperative cream stations and 9 of the 19 local cooperative creameries in North Dakota in 1930 and 32 of the more than 50 cooperative creameries in the 9 northwestern counties of Minnesota. The organization, financing, and operating methods of the North Dakota stations and creameries and the production trends and operating methods of the Minnesota creameries are described, and the outlook for cooperative cream stations and creameries in North Dakota is discussed. The development, organization features, financing, and operation of the Land O'Lakes Creameries, Inc., a federation of cooperative creameries, and the organization, operating methods, etc., of cooperative centralizers in North

Dakota and other States are described. Appendixes include legal forms for the organization and operation of cooperative creameries under the laws of North Dakota.

The cooperative cream stations reporting in 1928 handled from 32,000 to 165,000 lbs. of butterfat, with operating expenses ranging from $974.57 to $4,664.37. The average total expenses of handling cream per pound of butterfat in 16 stations in 1927 and 20 in 1928 decreased from 3.81 cts. in 1927 and 3.08 cts. in 1928 for the stations handling from 30,000 to 49,999 lbs. to 1.78 and 2.17 cts., respectively, for the stations handling from 150,000 to 169,999 lbs. The average price per pound of butterfat paid member patrons by the stations handling the largest volume was 1.3 cts. higher in 1927 and 4.7 higher in 1928 than that paid by those handling the smallest volume. In 1928 the North Dakota creameries studied received from 58,000 to 208,450 lbs. of butterfat, averaging 128,000 lbs. The overrun for 5 of the creameries varied from 21.2 to 23.75 per cent, averaging 23.3 per cent, and the creamery margin varied from 4.17 to 6.85 cts. per pound. The cooperative creameries of the State in 1928 paid an average price of 47.15 cts. per pound for butterfat, as compared with 44.6 cts. per pound paid by the 18 cooperative cream stations.

In the 32 Minnesota creameries studied the overrun varied from 21.88 to 24 per cent and the creamery margin from 3.87 to 7.69 cts. These Minnesota creameries paid an average of 49.81 cts. per pound for all butterfat, as compared with 47.15 cts. paid by the North Dakota creameries, the difference being due largely to the differences in the quality of butter made. Data from 30 cooperative creameries in northern Minnesota indicated in 1928 that an increase of 34 per cent in the amount of butter scoring 93 or more gave an increase of 1 ct. per pound in the average price received for butter, and that a change of 1 ct. per pound in the butter price resulted in an increase of 2.16 cts. per pound in the butterfat price.

Analysis of the operations of a cooperative livestock concentration point, J. H. Lister and C. G. Randell (*U. S. Dept. Agr. Circ. 142 (1931), pp. 32, figs. 13*).—This is a report of a study of the organization and operation of the Washington Shipping Association, Washington, Ind. The territory served, and the organization, management, and equipment of the association are described. The local operating methods, agreement with truckmen, selling policy, insurance service, prorating service, accounting records, publicity and educational work, business handled, the performance of patrons and farmers' attitude toward the association, and the achievements of the association are discussed.

The association was organized in 1921 by the Washington Township Farm Bureau, and 4,015 animals were shipped that year, of which 3,349 head were hogs. In 1925 there were 472 patrons, and 15,193 animals were shipped, of which 11,660 were hogs. The number of patrons increased to 708 in 1928 and the shipments to 27,692 head, of which 22,481 were hogs. In 1925, 13 per cent of the patrons were not members of the farm bureau, and in 1928, 56 per cent. In 1928, 357 of the 472 patrons in 1925 made deliveries, and 250 new patrons were added. Members delivered an average of 32 animals in 1925 and 54 in 1928, as compared with 15 and 16 head, respectively, for nonmembers.

On sales of 4,679 hogs sold direct to a near-by packer from January 11 to April 25, 1927, it was estimated that the association obtained $2,254.20 more than would have been obtained had the shipments been made to the terminal market. Sales of 1,308 hogs to an eastern terminal market from January 18 to February 8, 1928, resulted in an estimated gain of $348.51 over what would have been received on a near-by terminal market. The association's insurance rates of 10 cts. per head on cattle and 3 cts. per 100 lbs. on other livestock

resulted in 1928 in a saving to the patrons of $776.52 over the cost at commercial rates and $668.16 due to the difference between the premiums collected and the losses paid.

Crops and Markets, [December, 1930, and January, 1931] (*U. S. Dept. Agr., Crops and Markets, 7 (1930), No. 12, pp. 465-536, figs. 3; 8 (1931), No. 1, pp. 32, figs. 3*).—The usual tables, graphs, reports, summaries, and notes are presented. No. 12 includes tables showing for 1929 and 1930, by States and totals for the United States, the acreage, yield per acre, production, farm price December 1, and total value at the December 1 price of various cereal grains, forage crops and seeds, fruits and vegetables, nuts, tobacco, cotton, and cottonseed; and by States, by years, 1927-1930, for different truck crops raised for shipment the acreage, yield per acre, production, price per unit of production, and farm value.

Perquisites and wages of hired farm laborers, J. C. FOLSOM (*U. S. Dept. Agr., Tech. Bul. 213 (1931), pp. 58, figs. 6*).—This study is based on 3,536 replies to a questionnaire regarding noncasual (hired for a crop season or longer) hired farm laborers and 5,330 replies to a questionnaire regarding casual laborers (hired for a short time only). The data for noncasuals are for the year 1925 and those for casuals for 1926. Tables, maps, and charts are included and discussed showing for noncasual laborers, by States, the average wages and values of perquisites for married and unmarried laborers; and by geographic divisions the value of different types of perquisites and the percentage of total remuneration formed by perquisites and wages, and the percentage of laborers receiving perquisites, by marital status. The wages of the laborers are compared with wages in other industries and the value of perquisites with items of living costs of city families.

For the casual laborers, sources of such labor, the daily wages, kinds and values of perquisites in different types of agriculture, the proportions different perquisites are of wages and of total perquisites are discussed.

The questionnaires are included in appendixes.

Perquisites or privileges of value were given 97.5 per cent of the noncasual and 85.5 per cent of the casual laborers, and formed 39.5 per cent of the total remuneration of the noncasuals and 23.3 per cent of the casuals. Daily wages averaged $1.55 and perquisites $1.01 for the noncasual and $3.18 and $1.27, respectively, for the casual laborers. Of the noncasual laborers, 50.5 per cent received board and 74.3 per cent lodging, and of the casual laborers 74.1 and 61.7 per cent, respectively. Board constituted 16.2 per cent of the total remuneration of noncasuals and 14.1 per cent of that of casuals. Lodging (room or house) constituted 7.2 per cent for the noncasuals and 5.9 per cent for the casuals. No other perquisite amounted to over 2.3 per cent for noncasual or over two-thirds of 1 per cent for casual laborers. The percentages of the noncasual laborers who received other perquisites were for dairy and poultry products 27.3, meats or meat products 16.1, vegetables and fruits 25.4, privilege of keeping livestock 56.3, garden space 48.1, garage 58.4, use of horses or mules 59.4, and use of tools and vehicles 57.6. The percentages varied greatly between married and unmarried laborers. The percentages of casual laborers receiving other perquisites were for fuel 18.3, light 14.6, food produced on the farm 8.4, foodstuffs not produced on the farm 1.4, transportation between lodging and working place 12.9, and other use of horses, mules, and vehicles 11.8. Perquisite values equaled 79 per cent of the money wages of noncasuals receiving board and 51 per cent of those not boarded, and 41 per cent of the wages of casuals receiving board and 8 per cent of those not boarded.

Share leasing contracts, W. D. NICHOLLS (*Kentucky Sta. Bul. 307 (1930), pp. 417–443*).—The types of contracts, privileges allowed tenants, and the usual share-leasing terms for different crops and dairying are summarized, and the forms of share contracts used on farms in various sections of the State are included.

Taxation in Connecticut, M. S. KENDRICK (*Connecticut Storrs Sta. Bul. 166 (1930), pp. 145–188, figs. 2*).—The results of a preliminary survey made in 1930 are reported, emphasis being placed on the relation of taxation to agriculture. The relation of taxes to the income of the farm and the farmer, assessment of farm property, the index number of taxes on farm property, State and local expenditures and their financing, the tax system of the State, and State aid to local units are discussed.

Property taxes were found to have taken an average of 9.5 per cent of the net income and 29.7 per cent of the labor income in 1926 on 187 tobacco farms. For 117 dairy farms the averages were 12.8 and 18 per cent, respectively, in 1928, and for 71 such farms 9.4 and 11.7 per cent, respectively, in 1929. The percentage that assessed value was of estimated value on 283 farms in 25 towns varied from under 20 to over 100 per cent, that on 42 farms being less than 40 per cent, and that on 68 farms over 80 per cent. The high-value farms were decidedly underassessed relative to the low-value farms.

The index of agricultural taxes (personal and property taxes included) increased 130 per cent from 1915 to 1928, as compared with an increase of 51 per cent in the index of prices paid farmers for products. From 1916 to 1928 total disbursements (exclusive of funds from bonds) of the State government increased approximately 364 per cent. During the same period total expenditures other than interest, sinking fund, and payment of debt increased approximately 199 per cent for towns, 227 per cent for counties, and 191 per cent for municipalities. From 1916 to 1929 the rates of taxation for State purposes showed a decided stability, some increasing and some decreasing but most remaining stationary, and the net debt of the State was reduced $10,460,496. Net debt increased $16,337,084 in towns, $2,229,492 in counties, and $69,832,095 in municipalities from 1916 to 1928. The average tax rate of towns increased from 15 to 22.9 mills.

The essential weakness of the Connecticut tax system is held to be the failure to make sufficient use of the principle of ability to pay. This is evidenced in part by the fact that of the $97,233,375 taxes collected in the fiscal year 1929, $64,959,694 was from the general property tax. A personal income tax and an increase in the gasoline tax are suggested as sources of additional revenue.

Tax delinquency in the forest counties of the Lake States, H. H. CHAPMAN and D. PINGREE (*U. S. Dept. Agr., Forest Serv., Forest Taxation Inq. Prog. Rpt. 10 (1930), pp. [8]+15, pls. 9*).—This study is based on field investigations in Minnesota in 1926 and 1927, in Wisconsin in 1926 and 1927 in cooperation with the College of Agriculture of the University of Wisconsin, and in Michigan in 1927, together with studies of the Forest Service in Wisconsin in 1926 and of the Wisconsin Experiment Station, 1921–1927 (E. S. R., 60, p. 86).

Tables and charts are included showing by years, 1917–1927, for the 16 northeastern counties of Minnesota grouped according to agricultural development, for Winona County, and for the State the levies of taxes and of special assessments, the amounts and percentages of such taxes and assessments reported delinquent, and the deficiency amounts and percentages in total collections compared with current levies; for the 16 northeastern counties, by the groups, the areas and percentages of taxable unplatted land delinquent for 1 to 3 and more than 3 years and not delinquent, 1926–1928, the acreage and percentage of

unplatted land, tax paying, tax delinquent, and tax exempt in 1926; for 1926–1927 the areas and percentages of land delinquent in large and small holdings in the 6 northeastern counties; the areas and percentages of land delinquent and not delinquent in 1928 in 17 northern counties of Wisconsin; the areas and percentages of unplatted land of different kinds in the Lower and Upper Peninsulas of Michigan delinquent in 1899–1926; comparison of areas and percentages of land delinquent 3 years and 7 months or more in selected towns of Minnesota in 1913 ad 1926; areas of privately owned lands; the areas and percentages sold for taxes, by ownership classes, in selected years in selected towns in Wisconsin, 1919–1926; and the area and assessed value of land delinquent 3.5 years or more in the town of Foster, Ogemaw Co., Mich., by years 1904–1926, and the tax delinquent areas in Michigan by periods, 1899–1926.

Farm accounts that count, R. R. Hudelson (*Illinois Sta. Circ. 362 (1931), pp. 20, figs. 7*).—This circular describes the simplicity of farm accounts, how they may be kept, the data which they present, and their value to the farmer.

Prices of Illinois farm products from 1921 to 1929, L. J. Norton (*Illinois Sta. Bul. 363 (1930), pp. 515–599, figs. 33*).—This bulletin deals with the changes in the prices of 20 products, and is based on the prices collected monthly by the U. S. Department of Agriculture. The situation for each of the commodities, variations among the prices of the individual products, the changes, 1921–1924 and 1925–1928, the permanency of differences in price relationships, the relation of prices of farm products to those of things bought by farmers, general causes of the low purchasing power of farm products, the variability of prices of different commodities, and the variations among different districts and from month to month in different parts of the State are discussed.

Prices paid for Maryland farm products, 1851–1927, R. F. Hale (*Maryland Sta. Bul. 321 (1930), pp. 206, figs. 23*).—"Historical farm price series have been assembled on a monthly basis for 34 different products, and on an annual basis for tobacco, truck, and canning crops." The data for each product are combined by source groups into district averages, and by districts into State averages. Prices collected by the U. S. Department of Agriculture are used beginning with 1908 for crops and with 1910 for livestock. Records of mill offices, newspaper files, manor homes, and country stores, county court records, etc., were used for earlier years. Other tables are included covering the value of currency in gold, 1862–1878; the price of products on a gold basis, 1862–1878; wholesale prices of farm products at Baltimore; wages of hired farm labor; value of farm land; ratio of prices to wholesale prices in the United States; acreage and production of crops; number of livestock on farms; and production of dairy and poultry products.

Part 1 (pp. 4–31) discusses, with charts, the index of Maryland farm prices, wheat prices, prices of other farm products, factors affecting prices, wages and farm prices, farm and market prices, wholesale prices in the United States, and the relation of farm prices to market prices. Part 2 (pp. 32–53) describes the data used and the methods used in assembling and handling them. Part 3 (pp. 54–205) includes 201 statistical tables.

This study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Family living expenditures on Ohio farms, C. E. Lively (*Ohio Sta. Bul. 468 (1930), pp. 36, figs. 2*).—This report is based on account-book records for the years 1926–1928 kept by 117 families in 23 counties. The keeping of the books was supervised by the home management specialist and the county extension agents of the agricultural extension department of the Ohio State

University. Owner operators furnished 145 records, managers 1, and renter operators 41. Fifty records were obtained for 1926, 68 for 1927, and 69 for 1928. The general characteristics of the families as to tenure, size of business, size of family, age and schooling of operator and home maker, schooling of children, reading matter, facilities for communication, the farm house, and improvements desired are described. Tables are included and discussed showing the average total cash receipts from different sources and the relation of total cash receipts to farm expenses and net cash receipts, expenditure for family living, variations in cash expenditure and in value of food and fuel furnished by the farm, and the yearly and seasonal variation in family living factors. A study was made of the relation of total receipts to farm expense and family living, of food and fuel furnished by the farm to total receipts, of size of family to receipts and living expenditures, of schooling to cash expenditure for living, of conveniences possessed to cash expenditure for living, of affiliation with organizations to cash expenditure for living, and of certain other factors to cash expenditure for living.

The total cash receipts averaged $3,643 per year for owners and $2,986 for tenants. Nearly 16 per cent of such receipts were from nonagricultural sources. Owner families spent an average of $1,149 in cash for family living, and $311 worth of food and fuel were supplied by the farm. Tenants spent $1,042 and the farm supplied $291 worth of food and fuel. When house rent was included, the farm families were found to be living as well as families in Columhus spending from $2,000 to $2,500 for family living. The total average cash recipts were 22.2 times as high for the families receiving $10,000 and over as for those receiving under $1,000. Farm expenses were 37.4 times, investment funds 34.4 times, and family living expenditures 2.6 times as high. Year to year receipts varied more than cash expenditure for living. Of living expenditures, those for food varied least and those for health and furnishings most. There were decided seasonal variations in the family budget, both in cash expenditures and food and fuel furnished by the farm. All types of expenditures for family living increased with increased cash receipts. Total cash receipts and size of household accounted for 35 per cent of the variation. Holding size of family constant, receipts, schooling of operator and home maker, number of conveniences possesesd, and index or organization relationships accounted for 50 per cent of the variation. There was no close relationship between value of food and fuel furnished by the farm and either total cash receipts or total cash expenditure for living.

The Lansing food survey, C. A. Scholl and W. O. Hedrick (*Michigan Sta. Tech. Bul.* [107] (1930), pp. 152, figs. 21).—This bulletin is based upon the following data: Six hundred and one schedules obtained from representative farmers in 8 townships, a retail store survey covering 250 stores, and surveys of the railroad receipts of fruits, vegetables, and other commodities, express and electric railway receipts, local produce wholesalers, chain stores, commercial trucking companies, the meat trade, milk, butter, and ice cream distributors, mills, and of Lansing as a market.

The seven parts of the bulletin deal with the natural conditions and the agricultural industry of the area, dairy products, fruits and vegetables, livestock and meats, eggs, cash crops, and Lansing, the market. The place of dairying as a local enterprise; the marketing machinery for milk and dairy products; factors influencing the local price, supply, and demand for milk; consumption of dairy products for Lansing in 1927; the problem of adjusting supply and demand for fluid milk; fruit and vegetable production as a local farm enterprise; the marketing of local fruits and vegetables; Lansing's trade

in fruits and vegetables for 1927; consumption of fruits and vegetables; status of the local livestock industries; how Lansing gets its meat supply; the production, distribution, and consumption of eggs; the cash crops potatoes, beans, and wheat; and Lansing's possibilities as a market for local farmers are discussed.

The negro wage earner, L. J. GREENE and C. G. WOODSON (*Washington, D. C.: Assoc. Study Negro Life and Hist., 1930, pp. XIII+388, figs. 19*).—This report of the three-year survey of social and economic conditions of the negroes of the United States, made by the Association for the Study of Negro Life and History, includes chapters on agriculture up to the World War and agriculture after 1917.

Movement of open country population in Ohio, C. E. LIVELY and P. G. BECK (*Ohio Sta. Bul. 467 (1930), pp. 48, figs. 3*).—This is a study of the mobility history of 1,275 families in the 3 rather distinct socio-economic sections of the State. Beginning in 1927, 465 schedules were obtained from the western section, the leading agricultural section of the State; 511 from the northeastern section, a highly urbanized section; and 299 from the southeastern section, much of which is unprofitable for agriculture. Eighty-two per cent of the families were classified as farm families. More than 50 per cent of the nonfarm families were in the northeastern section. The population changes, 1840–1920; the vital statistics; the race, nationality, age, sex, and occupational distribution; and the tenure distribution of the farmers in the 3 areas are discussed.

Analysis is made of the nature and extent of the occupational and spatial movements in each area, tables being included showing the occupation of parents of operators and home makers of farm households, occupation of parents of heads of nonfarming households, occupational history of the households, children 18 years of age and older—total and number away from home, number of children who had started for themselves, occupation of adult children by occupation and tenure of parents, place of birth in respect to certain geographic areas of farmers and nonfarmers in relation to present residence, place of birth of farmers in respect to open country, village, or city, residence of farm and nonfarm households since formation, number of years owner and renter farmers have been on present farm, and the number of moves by tenure. The relation of population movement to certain factors are analyzed, number of moves and range in movement, place of birth, parental occupation, inheritance of farm, age at marriage, age of household, years on present farm and in the township, size of farm business, schooling of operator, organization membership, and occupational change and territorial mobility being considered.

The study indicates that both spatial and occupational mobility of the farm population have been on the increase during the last 50 years, but that the farm population is still very stable. Of the farm operators studied, 93 per cent were born in the open country and were the sons of farmers, 46 per cent being born in the same township and 62 per cent in the same county where living at the time of the survey. Approximately one-fourth of the households had since formation lived on the same farm, one-half in the same township, and two-thirds in the same county. Owner households had moved an average of 1.3 times and renters 1.7 times. A significant positive correlation was found between number of moves and radial distance moved. Inheritance of farm property increased the population stability, and 86 per cent of the households that had always lived on the same farm had inherited the farm in whole or in part. A significant positive correlation between mobility and age of household existed in the case of tenants but not in the case of owners.

The correlations of years on farms and of years in township with mobility were not sufficiently high to render these factors good measures of mobility. Territorial mobility decreased with size of farm business. There was slight evidence that increased schooling resulted in fewer moves in the case of owners. It did not appear to be related to the mobility of tenants. Mobility apparently decreased affiliation with local organizations by both owners and tenants. Shifts in occupation tended to increase mobility, the greatest shifts in open country populations both in space and occupation taking place in the urbanized sections around large cities.

A systematic source book in rural sociology, I, edited by P. A. Sorokin, C. C. Zimmerman, and C. J. Galpin (*Minneapolis: Univ. Minn. Press, 1930, vol. 1, pp. XX+645, figs. 7*).—The purpose of the Source Book, of which this is the first volume, "is to give a more or less exhaustive survey of the knowledge in the main fields of rural sociology. It is intended to be a complete encyclopedia, a reference work, and a substantial systematic treatise in the field. It aims to give the reader an adequate and up-to-date knowledge of present-day theories in European, Asiatic, and American scientific literature. This main objective makes the peculiarities of the publication comprehensible. Since it is not an attempt to popularize the science of rural sociology and since it is not intended as a text for beginners, popular and entertaining readings are not included. Since it is intended to be a systematic treatise, its introductions give a systematic analysis of the problems, and the readings are arranged in such a way that they supplement what is briefly touched upon in the introductions. The introductions and the readings together attempt to give a well-rounded, coherent, and factually exhaustive picture of the phenomena in the various fields. Since it is planned as a reference work, it is heavily weighted with factual data and references. This abundance of figures and data may cause the inexperienced or casual reader to fail to grasp the systematic plan and logical consistency of the work, but the careful and competent reader should profit from it without losing the logically coherent system of rural sociology incorporated in the Source Book."

This volume includes chapters as follows: History of rural sociology—ancient sources, history of rural sociology—fourteenth to nineteenth centuries, origin of rural-urban differentiation, fundamental differences between the rural and urban worlds, ecology of the rural habitat, differentiation of the rural population into cumulative communities and functional associations, social stratification of the agricultural population, mobility of the rural population, and fundamental types of rural aggregates—evolution of the forms of landownership and land possession.

Some factors affecting the size of rural groups in Virginia, C. H. Hamilton (*Amer. Jour. Sociol., 36 (1930), No. 3, pp. 423–434*).—Partial analysis is made of data from U. S. Census and Virginia State Department reports and the Virginia Rural Church Survey to determine the effects of rural population density, membership-population ratio, distribution of group meeting places, social and racial stratification, type of roads, transportation facilities, associational attitudes or habits, urbanization and depopulation, and other miscellaneous factors on the size of church and school groups.

The author concludes that "by the use of such objective data as the number of farms on improved roads, population per square mile, number of motor vehicles per 1,000 population, and the size of rural church and school groups, it will be possible to construct a county index of rurality or social contact which should be useful to administrators of any type of organization work or to research workers in selecting type areas for study."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The vocational stability of Connecticut farmers, J. L. HYPES (*Social Forces, 9 (1930), No. 2, pp. 191–200*).—The length of farm tenure, changes in type of farming by farm owners, and the methods of attaining ownership in the different types of farming in the State are discussed in their relation to vocational education in agriculture. The facts of significance to vocational education in agriculture brought out by the data were (1) the great diversity in the vocational stability of the farmers studied, (2) the persistence of apprenticeship education in farming, and (3) the persistence of certain types of farming in the State. It is pointed out that two types of education are needed, (1) education to supplement the knowledge acquired by experience by those entering the difficult entry types of farming, and (2) training to give the knowledge acquired through two or three years on the farm for those farmers entering from nonagricultural occupations.

Cooperative extension work, 1928, C. B. SMITH (*U. S. Dept. Agr., Coop. Ext. Work, 1928, pp. II+134, figs. 28*).—This report of cooperative extension work in agriculture and home economics of this Department and of the State agricultural colleges covers the year ended June 30, 1928, as regards funds, and the year ended December 31, 1928, as regards results of work.

The funds and staff; emergency activities; methods of teaching; visual instruction and editorial work; methods and results in county agricultural agent, home demonstration, and boys' and girls' 4-H club work; work with negroes; farmers' institutes; and the economic results of extension work are described and discussed. Pages 91–134 are devoted to statistical tables.

FOODS—HUMAN NUTRITION

Index to the literature of food investigation, compiled by A. E. GLENNIE (*[Gt. Brit.] Dept. Sci. and Indus. Research, Index Lit. Food Invest., 2 (1930), No. 1, pp. IV+108*).—This issue of the series of annotated literature references on food investigation (E. S. R., 63, p. 890) contains a brief review, with 79 citations, of progress during 1928–29 in the preservation and transport of meat, fish, and fruits and vegetables, together with the usual sections of annotated references.

The nutritive value of cereal breakfast foods, IV, V (*Jour. Nutrition, 3 (1930), No. 1, pp. 1–22, figs. 2*).—In continuation of the investigation noted previously (E. S. R., 63, p. 390), two papers are presented.

IV. *The response of the human stomach,* H. D. Clough, J. S. Carman, and E. M. Austin (pp. 1–16).—The gastric response of the human stomach to different cereal foods was tested by evacuating the entire stomach contents on successive days at different intervals after eating the same cereal cooked in the same manner and determining the amount of nitrogen remaining in the stomach at each interval, the procedure being repeated in successive weeks with different cereals.

Two series of experiments were run, the first with three subjects and three cereals and the second with four subjects and four cereals. The individual differences in rate of digestion were greater than the differences shown by the same person for the various cereals. Wheat Endosperm gave slightly better results than whole oats, the former showing an average of 83 and the latter of 76 per cent evacuation at the end of two hours. Roughage in the form of bran in normal proportions or less appeared to have very little effect upon the evacuation time of the stomach.

V. *The biological value of some cereal proteins as determined on rats,* H. A. Mattill (pp. 17–22.—Using the method described by Mitchell (E. S. R., 51, p.

407), the author, with the assistance of M. M. Clayton, determined the biological values of the proteins of Precooked Oats, Wheat Endosperm, and "Whole Wheat" and also of dried milk, the materials in each case being fed at approximately a 5 per cent protein level. "The average biological values obtained from 6 to 8 periods on each food were 89 for milk, 82 for oats, and 73 and 72, respectively, for the two wheat preparations. The figures are in substantial agreement with those for similar foods obtained by other workers."

Analysis and food value of some unusual Philippine fruits, A. D. FRANCISCO and P. J. WESTER (*Philippine Jour. Sci., 43 (1930), No. 4, pp. 655–663, pls. 9*).—In continuation of the study of the composition of food materials in the Philippines (E. S. R., 62, p. 686), descriptions, photographs, and proximate analyses are given of 18 unusual Philippine fruits, including five varieties of bananas.

The nature of dietary deficiencies of milk, J. E. BECKER and E. V. MCCOLLUM (*Amer. Jour. Hyg., 12 (1930), No. 2, pp. 503–510*).—A tabulated summary, with brief discussion, is given of the results obtained in an investigation during the years 1922 to 1929 of the nature of the dietary deficiencies of milk as determined by growth curves, reproductive behavior, and general progress of rats on a basal diet of whole milk powder and dextrinized starch, with varying aditions. Whole-milk powder in most cases constituted 60 per cent of the diet and the dextrinized starch varied with the different additions, in most cases from 1 to 10 per cent of the starch being substituted by a natural food.

On diets consisting chiefly of the milk and dextrinized starch progress was not normal. The growth curves flattened out after about three months, and normal reproduction was seldom observed. "Of 38 diets in which milk powder was used at a 60–85 per cent level in combination with other substances, only 24 sufficed for production of young. In only four cases were there fifth generation animals. The supplements in these diets were cooked dried beef liver 4 and 5 per cent, yeast 5 per cent, and a combination of ferric citrate and copper sulfate."

The authors are of the opinion that it is the richness of liver in iron and copper which makes it an effective supplement to milk, but that a combination of milk, iron, and copper is still capable of further improvement.

Influence of an exclusive meat diet on the human intestinal flora, J. C. TORREY (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, pp. 295, 296*).—This is a preliminary report of a study of the fecal flora of the subjects in the investigation of the effect of an exclusive meat diet on man, other phases of which have been noted from reports by Lieb and Tolstoi (E. S. R., 61, p. 589), Tolstoi (E. S. R., 62, p. 491), and McClellan and DuBois (E. S. R., 64, p. 493).

The fecal specimens of all three subjects while on the meat diet were similar in H-ion concentration, direct microscopic count, and cultural findings. The H-ion concentrations ranged from pH 7 to 6. The total bacterial counts decreased from normal values by about 50 per cent and in one subject even more. This was attributed chiefly to the suppression of lactic-acid producing types such as *Lactobacillus acidophilus*, enterococci and streptococci, and to a less extent of *Bacillus coli*. The decrease in fermentative organisms was accompanied by no increase in putrefactive anaerobes and no introduction of unusual types of intestinal organisms. In all three subjects there was at first an increase in the spore-bearing anaerobes, particularly *B. welchii*, but after a year the counts of this organism in the two subjects who continued on the diet were no higher and at times lower than for the preceding period. Proteolytic anaerobes were not added to the flora nor were the native ones stimulated to greater action.

It was concluded that with the exception of transitory predominance in one subject of *B. proteus* there was no evidence that a long continued exclusive meat dietary favors the development of putrefactive conditions in the colon of individuals with normal digestion. "It should not be assumed, however, that the same findings would hold for individuals with defective gastric or intestinal digestion and assimilation."

Beef: How to choose and cook it, F. G. SEMPLE (*Canada Dept. Agr. Bul. 135 (1930), pp. 52, figs. 10*).—This bulletin has been prepared "in the hope that it will create a keener appreciation of first-class beef on the part of the Canadian consumers, and that it will assist them in obtaining the greatest possible value for their money." Information is first given on the food value of beef, the system adopted by the Dominion Department of Agriculture for branding the two highest grades, and the distinction between the different priced cuts. The general principles of cooking and the most suitable methods for cooking the various cuts are then discussed, and finally a selected list of recipes is given. Excellent illustrations are included of typical cuts of beef.

Veal in variety, E. LATZKE and C. LEEBY (*North Dakota Sta. Bul. 239 (1930), pp. 32, figs. 13*).—This bulletin, which is based upon extensive cooking tests on veal undertaken as a part of the national project on factors affecting the quality and palatability of meat, contains advice to the housewife on purchasing veal, with a list of the available cuts, relative prices, approximate weight, number of servings, and appropriate methods of cooking. This is followed by directions for the care of veal in the home, a discussion of the food value of veal compared with other meats and of the principles of veal cookery, and general directions with specific recipes for cooking various cuts. Some of the recipes have been noted in a preliminary report (E. S. R., 63, p. 890).

The nutritional potency of fresh, cooked, dry, and alcohol-extracted liver, J. S. MCHARGUE, W. R. ROY, and F. E. HULL (*Jour. Nutrition, 3 (1930), No. 1, pp. 49–60, figs. 3*).—In this contribution from the Kentucky Experiment Station, data are reported on the mineral and nitrogen content of the moisture-free normal livers of several domestic animals; on the effect of feeding the air-dried livers to rats as a supplement to a synthetic ration of starch 50, casein 20, cane sugar 12, lard 6, filter paper 10, and salt mixture 2 per cent; and on the ash content of the feces of the experimental rats.

Each rat received about 4 gm. of the dried liver, equivalent to about 16 gm. of the fresh, daily. None showed any marked improvement over those on the synthetic diet. Of various materials tested as further supplements, raw and cooked tomato and potato were without effect, but raw and cooked liver brought about rapid growth.

The analyses of the livers showed the copper content of calf, lamb, and steer livers to be approximately 10 times higher than that of the liver of hog, pig, horse, chicken, or rat, or cod-liver chum. The results for iron and manganese were slightly higher in the livers containing the smallest amount of copper. The methods followed in the ash analyses were not stated.

The oxalic acid content of vegetables used as greens, A. E. RYDER (*Jour. Home Econ., 22 (1930), No. 4, pp. 309–314*).—Analyses for oxalic acid are reported for 3 samples of spinach and of mustard greens, 2 of beet greens, and 1 each of New Zealand spinach, a cold water extract of New Zealand spinach, kale, turnip tops, and dandelion greens. The oxalic acid content of the spinach ranged from 0.486 to 0.692 per cent of the fresh vegetable. The 2 samples of beet greens contained 0.622 and 0.753 per cent, and of the New Zealand spinach and cold water extract of the same 1.198 and 0.45 per cent, respectively. No oxalic acid could be detected in the other greens. It is suggested that in occasional pathological conditions where it is considered advisable to restrict

oxalates in the diet it would be well to use dandelion greens, kale, turnip tops, or mustard greens instead of spinach.

Iron, copper, and manganese content of some common vegetable foods, R. E. REMINGTON and H. E. SHIVER (*Jour. Assoc. Off. Agr. Chem., 13 (1930), No. 1, pp. 129–132*).—Iron, manganese, and copper were found in the leaves and shoots of the 18 vegetables analyzed to the average amount of 682, 108, and 11 parts per million, respectively; in the roots and tubers, 133, 32.2, and 8.2 parts per million, respectively; and in fruits, 139, 32.8, and 12.5 parts per million, on the basis of dry matter.

"When compared with root and fruit vegetables, the green leafy vegetables were found to be outstanding as sources of iron, manganese, and copper."

Some observations of the effect of the addition of iron to an adequate diet, M. T. POTTER and M. M. KRAMER (*Kans. Acad. Sci. Trans., 32 (1929), pp. 31–33, fig. 1*).—The addition from the time of weaning of 0.00025 or 0.0005 gm. of iron in the form of a specially prepared solution of ferric chloride to the Sherman stock ration for rats was found to increase the hemoglobin of the rats to a marked extent until after the tenth week, when the levels were about the same for those on the unsupplemented and supplemented rations.

Rôle of copper in hemoglobin formation, H. L. KEIL and V. E. NELSON (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 392, 393*).—In this preliminary report it is noted that in rats in which the hemoglobin had been reduced to from 2 to 5 per cent by whole milk feeding, it was possible to increase the hemoglobin to 16 per cent in 9 weeks by the addition of ferric chloride at a level of 0.5 mg. of Fe, but that if copper sulfate at a level of 0.05 mg. Cu daily was given with the ferric chloride regeneration of hemoglobin was much more rapid and complete. Although the ferric chloride was copper-free, as shown by a Hilger spectrograph, it is stated that the milk used contained between 0.35 and 0.44 mg. of Cu per liter. Anemic rats receiving 3 mg. of copper as copper sulfate per rat daily showed a slight gain in hemoglobin, which was attributed to the presence of some iron in the c. p. $CuSO_4$. The addition after 2 weeks of 0.2 mg. of iron as ferric chloride brought about more rapid regeneration. Manganese chloride, when fed with ferric chloride in amounts furnishing 0.1 mg. of Mn per rat per day did not increase the hemoglobin values above the figures for iron alone.

Rats on whole milk, wheat embryo oil, and ferric chloride did not reproduce, but the addition of copper sulfate to the diet resulted in normal reproduction and fair lactation.

Iodine in nutrition in North China, W. H. ADOLPH and S. C. CH'EN (*Chinese Jour. Physiol., 4 (1930), No. 4, pp. 437–447, fig. 1*).—Data are reported on the iodine content, as determined by the Fellenberg method, of water, cereals, root and leafy vegetables, fruits, eggs, milk, and meat in goitrous and nongoitrous districts in North China. From these figures and dietary studies reported by Wu and Wu (E. S. R., 60, p. 894), calculations were made of the average daily intake of iodine per person in goitrous and nongoitrous areas.

The foods tested which contained the largest amount of iodine were in decreasing order yams, eggs, leafy vegetables, and fruit. Cereals, milk, and some of the root vegetables were of low iodine content. The values for the average daily intake of iodine from the various types of food in goitrous and nongoitrous regions were cereals 0.008 and 0.0022 mg., legumes 0.0005 and 0.0003, vegetables and fruits 0.006 and 0.0047, meat, fish, and eggs 0.0026 and 0.0016, and water 0.0013 and 0.0003 mg., respectively. The total value of 0.0184 mg.

for the nongoitrous area is only a little higher than the value 0.014 mg. estimated by Fellenberg to be the normal daily requirement. Brief metabolism experiments conducted on two students at Yenching University showed an average iodine intake of 0.0262 mg. and an output of 0.0302 mg.

The behavior of Sudan III when fed with carbohydrate, E. H. MacArthur (*Science, 72 (1930), No. 1853, p. 14*).—The author notes briefly that when Sudan III is fed with cornstarch alone to rats the body fat, particularly the subcutaneous fat and that around the intestines and testes, becomes colored in the same manner as when Sudan III is fed with fat. Attention is called to previous observations that fat is necessary for the transport of the dye. "In the present experiments, the question as to whether or not the dye fed with carbohydrate attaches itself to fat in its course through the body or whether fat is synthesized from the carbohydrate fed and deposited as colored fat can not be answered now."

The effect on foods of fumigation with hydrogen cyanide, G. W. Monier-Williams ([*Gt. Brit.*] *Min. Health, Rpts. Pub. Health and Med. Subjs. No. 60 (1930), pp. 32*).—This is a compilation of information from various sources, including hitherto unpublished studies by the author, on the extent to which different foods may absorb hydrogen cyanide, the object being to determine under what circumstances the gas may be used with safety for the destruction of vermin and insect pests.

It is brought out that the amount of hydrogen cyanide absorbed and retained by foods is influenced chiefly by the strength of the gas and the duration of the fumigation, the moisture content, state of subdivision, and method of packing of the food, and the period of subsequent ventilation. In general, foods treated with not more than 1 volume of HCN in 200 volumes of air and subsequently exposed to air do not retain more than 20 parts of HCN per million. Overtreatment with hydrogen cyanide may cause serious damage to fresh fruit and vegetables through interference with the natural processes of respiration.

Digestion: Efficiency with various foods and under various conditions, J. H. Childrey, W. C. Alvarez, and F. C. Mann (*Arch. Int. Med., 46 (1930), No. 3, pp. 361–374, figs. 4*).—In this continuation of the investigation by Hosoi, Alvarez, and Mann (E. S. R., 59, p. 189), the authors found that, contrary to the opinion expressed in the previous paper, finely divided foods such as meat and Swiss cheese were not as well digested as lumps of the same material. Combining certain foods such as bread and milk and raw egg and milk improved the digestion of both substances. The addition of lemon juice to food hurried the progress of the residue through the bowel and interfered somewhat with the completeness of digestion. Anxiety and excitement interfered with digestion. Food taken in large amounts was better utilized than when taken in several fractions at half-hour intervals.

The influence of high and low protein diet on the basal metabolism and the chemistry of blood and urine in normal women, C. C. Wang, J. E. Hawks, B. Huddlestun, A. A. Wood, and E. A. Smith (*Jour. Nutrition, 3 (1930), No. 1, pp. 79–98*).—Six normal women varying in age from 17 to 36 years served as subjects in this investigation, which covered a period of 81 days. The subjects received for 5 weeks a diet containing 2 gm. of protein and sufficient carbohydrate and fat to furnish 40 calories per kilogram of body weight. During the following 3 weeks the protein was gradually lowered to a level of 0.6 gm. daily. This diet was continued for 4 weeks. About a month later the subjects were placed on a freely chosen normal diet for 2 weeks. During the three periods basal metabolism determinations were made on two consecutive days each week and on the same days samples of blood were taken for analysis. Blood pressures were taken weekly and 24-hour samples of urine collected on two consecutive days each week.

No marked differences were found in the three periods in the basal metabolic rate or blood pressure. During the high protein period there were increases in total nonprotein nitrogen, urea nitrogen, and creatine nitrogen in the blood, but no changes in uric acid, creatinine, and calcium. During the low protein period there was a slight increase in sugar and a marked increase in the blood lactic acid. In the urine the total nitrogen, urea nitrogen, ammonia nitrogen, uric acid, and creatine varied directly with the protein intake, and creatinine remained constant. The total titratable acidity in the urine varied with the ammonia and hence with the protein intake. Lactic acid remained constant, but there was both a daily and individual variation in organic acids.

Biological value of the proteins of mung bean, peanut, and bean curd, J. H. C. Pian (*Chinese Jour. Physiol., 4 (1930), No. 4, pp. 431–436*).—In this continuation of the study begun by Li (E. S. R., 63, p. 789) the biological values reported for the proteins of the mung bean, peanut, and soybean curd are 58, 59, and 65, respectively. The corresponding coefficients of digestibility were 86, 95, and 96 per cent, respectively.

The comparative value of different food proteins for reproduction and lactation in the rat.—II, Milk, egg, and meats, M. M. Clayton (*Jour. Nutrition, 3 (1930), No. 1, pp. 23–38*).—In this continuation of the investigation noted previously (E. S. R., 64, p. 291), the author, with the assistance of M. J. Cummings, has attempted to determine the relative value of milk and egg in comparison with the previously reported results for meats. The egg was fed in both cooked and raw form and the milk only in the dried form.

On rations containing 15 and 20 per cent of protein, with 20 per cent of fat, the egg appeared to be superior to milk for both reproduction and lactation. This was attributed partly to superiority in the ash content of the egg, since the addition to the milk ration of a special salt mixture containing some of the rarer minerals improved reproduction. Lactation on both the milk and egg rations was improved by the special salt mixture. In comparison with the materials studied previously, dried egg and kidney were ranked higher than milk or liver proteins, with muscle proteins lower than any of the others.

When the differences in the quality of the proteins were ruled out to a great extent by feeding them at a 20 per cent level, the vitamin E content of the five dried products, as determined by success in reproduction, was considered to decrease in the order egg, milk, round, liver, and kidney. Success in lactation on the different rations was found to depend largely on their content of vitamin B (B_1). Of the five materials tested in the two studies, egg seemed to require the fewest supplements, although in the raw state kidney ranked higher than egg.

The cystine deficiency of the proteins of garden peas and of potatoes, J. R. Beadles, W. W. Braman, and H. H. Mitchell (*Jour. Biol. Chem., 88 (1930), No. 2, pp. 615–622*).—This paper supplements a previous one by Mitchell and Beadles (E. S. R., 63, p. 393) in which paired feeding experiments were reported leading to the conclusion that garden peas and potatoes are deficient in cystine. In the present study fresh green garden peas were used instead of the canned peas of the former study, and the potato experiment was repeated with a larger number of rats. Nine pairs of rats were used for the experiments with peas and eight for those with potatoes.

The results in both series showed statistically significant greater gains in weight when the diets were supplemented with cystine, thus confirming the conclusions of the previous study.

Records of the refusals of food by the rats on the unsupplemented and supplemented diets showed that the common belief that the more complete of two diets will be consumed in greater amounts does not always hold. In the potato experiments there were 36 refusals of food by control rats to only 9 by the

cystine-fed rats, but in the garden pea experiments there were only 21 refusals by the controls to 47 by the cystine-fed rats. In the earlier investigation in which canned garden peas were used there were 59 refusals among the controls to 80 among the cystine-fed rats, and in the experiments with milk 48 and 42 refusals, respectively.

The relation between cystine deficiency in the diet and growth of hair in the white rat, J. R. BEADLES, W. W. BRAMAN, and H. H. MITCHELL (*Jour. Biol. Chem., 88 (1930), No. 2, pp. 623–627*).—A comparison of the weight of the hair of 17 pairs of the cystine- and noncystine-fed rats in the previous study showed that the coats of hair produced on the cystine-supplemented ration were not only heavier in absolute weight, but also heavier per unit of surface area than in the controls. This indicates that the growth of hair had been stimulated to a greater extent by the cystine supplement than had the growth of all of the tissues of the body.

The effects of high sugar diets on the growth and structure of the rat, C. M. JACKSON (*Jour. Nutrition, 3 (1930) No. 1, pp. 61–77, figs. 2*).—This study was undertaken from the standpoint of the possible harmful effects of high sugar content in rat diets in nutritional experiments, since on account of the chemical purity of commercial sucrose it is supplanting starch in many experimental diets.

Three diets were used. One, serving as control, consisted of cooked cornstarch 45, commercial casein 30, lard 20, and McCollum salt mixture (185) 4.5 parts. The second differed from the control only in the substitution of commercial sucrose for starch. The third consisted of commercial sucrose 80, casein 16, and McCollum salt mixture 4 per cent. Each animal received as daily supplements 3 drops of cod-liver oil, 0.3 gm. of dried yeast (Northwestern), and 0.3 gm. of wheat germ, and those on the third diet 10 drops of lard daily in addition. In general the experiments were continued until the rats reached practically adult weight. Observations were recorded on growth and general condition, reproduction, oestrous cycle, teeth, infections, weights of internal organs, and histological observations.

No abnormalities were found in the sugar-fed group beyond slight differences in weight of some of the organs and more marked differences in the liver. On the 80 per cent sucrose diet this organ was enlarged and showed on histological examination marked fatty deposits.

The author concludes that the high sugar diets have no detrimental effect upon the growth and general health of rats, but that caution should be exercised in applying this conclusion to human diets. This is particularly on account of the fact that an adequate intake of proteins, salts, fats, and vitamins is always secured in the experiments reported, while such conditions are usually lacking in high sugar diets for human consumption.

Studies in infant nutrition.—VI, Lactose and a maltose-dextrin preparation, J. R. GERSTLEY (*Jour. Amer. Med. Assoc., 95 (1930), No. 17, pp. 1233–1237, figs. 4*).—This is a general report on the chemical and clinical phases of the extensive infant feeding investigation which has been noted previously from the preceding papers in the series (E. S. R., 64, p. 92).

The nitrogen metabolism in infants on graded intake of soybean "milk" proteins, E. TSO and F.-T. CHU (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, p. 218*).—A further study of the nutritive value in infant feeding of soybean proteins (E. S. R., 63, p. 193) is reported briefly. The nitrogen balances were followed in two male infants 4 and 7 months old, who were given in different periods soybean milk preparations furnishing approximately 18.5, 13.5, 10.5, and 8.5 per cent protein calories, respectively, but the same

number of total calories per kilogram of body weight. In one period cow's milk was fed at a protein level of 12.2 per cent of the calorie intake.

The nitrogen balances were all positive on the soybean milk, but the retention increased with the level of intake and was not as high on the 18.5 per cent level as on the 12.2 per cent level of cow's milk. It is concluded that the soybean nitrogen absorption is distinctly lower than that of cow's milk nitrogen.

A statistical comparison of breast-fed and bottle-fed babies during the first year, with special reference to gain in weight and to morbidity, H. K. Faber and T. L. Sutton (*Amer. Jour. Diseases Children, 40 (1930), No. 6, pp. 1165–1176, figs. 7*).—A statistical study is reported of the relative rates of gain and incidence of infection in comparable groups of breast-fed and bottle-fed infants under favorable conditions. The conclusion is drawn that in general breast feeding is to be recommended for the first three months, provided the supply of milk is abundant and the progress satisfactory, but that when conditions suitable to good bottle feeding are present and the maternal supply is inadequate there need be no hesitation in regard to weaning after the third month. It is recommended, moreover, that when the baby can not get at least half of his food supply from breast feeding he should be weaned at once.

Reproduction and lactation on simplified diets, P. D. Wilkinson and V. E. Nelson (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, pp. 244, 245*).—This is a preliminary report of an extension to soybeans of the investigation of Guest, Nelson, Parks, and Fulmer (E. S. R., 56, p. 66) of the value of various grains as a source of vitamins B and G for reproduction and lactation. Soybeans were selected because of the success attributed to them by Daniels and Hutton (E. S. R., 56, p. 66) as a supplement to milk for reproduction.

It is reported that rats grew at a normal rate with 10, 20, 40, and 73.3 per cent of either Manchu, Sable, or Virginia soybeans as the sole source of vitamins B and G, that reproduction was normal on the lower but not on the upper levels of the soybeans, and that satisfactory lactation was not secured at any level.

Of various materials used as supplements to 15 per cent of Virginia soybeans as the sole source of vitamins B and G, hog lung and spleen and beef thymus were without effect. Hog pancreas and beef pancreas, brain, and heart improved lactation somewhat, and hog kidney and liver and beef liver to a marked extent. It is noted that the "lactating factor was destroyed in liver at 120° C. Ether extract of liver shows little or no lactating properties, but the residue does."

Applications of statistical method to the data of vitamin feeding experiments, I, II, M. H. Irwin, A. E. Brandt, and P. M. Nelson (*Jour. Biol. Chem., 88 (1930), No. 2, pp. 449–470*).—In these two studies reported from the Iowa Experiment Station, vitamin data extending over a considerable period of time were subjected to statistical analysis with a view to determining if possible the causes of the variability observed. The vitamin studies furnishing the data were a part of the general investigation of the effect of cultural conditions and degree of maturity on the vitamin content of vegetables (E. S. R., 61, p. 494; 63, p. 93).

I. *The per cent effect of measured variables* (pp. 449–459).—In this paper are reported the means and correlations of different variables, together with the percentage effect of certain of these variables on the gains in weight. During the course of the experimental work, two basal diets were used in the tests for vitamins A and B, respectively. In the A experiments the diets were those of Sherman and Munsell (E. S. R., 54, p. 89) and Osborne and Mendel, and in vitamin B experiments those of Sherman and Spohn (E. S. R., 51, p.

368) and Osborne and Mendel (E. S. R., 41, p. 762). The data were separated into groups according to the diets, and the means, standard deviations, and coefficients of variability calculated for each group.

In the A experiments the average number of days required for depletion was less on the Osborne-Mendel diet containing fat than on the Sherman-Munsell fat-free diet, the ratio of the mean difference to its standard deviation being 5.4. During the experimental period the gain in weight on the Sherman-Munsell diet was greater than on the Osborne-Mendel diet, the ratio of the mean difference to its standard deviation being 4.3. The gain in weight on the Sherman-Munsell diet was less per gram of food ingested and greater per calorie ingested than on the Osborne-Mendel diet.

In the vitamin B tests the comparison was rendered less valuable by the fact that the animals on the Sherman-Spohn diet were depleted for 2 weeks before the experiment proper was begun, but those fed the Osborne-Mendel diet containing the higher percentage of fat gained less and were somewhat less variable in their readings than the other group.

Among the four groups, the only one which did not show an increase in the coefficient of variability of the final weights over the initial was the vitamin A group fed the Sherman-Munsell diet. This general increase in variability is thought to emphasize the necessity of using a very large number of animals if attempts are made to discriminate between small differences in gains. Correlations were run between the variables initial weight, final weight, days on experiment, total food intake, and total gain. The more striking of these correlations were those between initial weight and total food intake, initial weight and total gain, and total food intake and total gain. The last-named correlation is considered of the greatest significance. This was also brought out by calculations of multiple regression coefficients and regression equations. It is concluded that emphasis should be placed upon the quantitative food consumption as having the greatest influence upon growth response.

II. *How many animals per experimental lot* (pp. 461–470)?—This paper, which should be consulted in the original, includes calculations, with the aid of multiple regression, of the standard deviations of 349 vitamin A test animals and 330 vitamin B test animals on the Osborne-Mendel diet plus weighed amounts of the vegetables being tested, and an explanation of the method of calculation which can be used to estimate from the results of preliminary experiments the number of animals required per experimental lot to obtain results of statistical significance.

The vitamins of water cress (Nasturtium officinale), L. B. Mendel and H. B. Vickery (*Jour. Home Econ., 22 (1930), No. 7, pp. 581–587*).—Studies on the content of vitamin B (B_1+B_2) and vitamin A in water cress (*N. officinale*) are reported, with the conclusion that the leaves are particularly rich in vitamin A and compare favorably with many other edible green leaves as a source of "the dietary factors formerly described as vitamin B." Vitamin E was found to be present in proportions larger than are usually found in lettuce. "The dietary value of water cress as a 'green' supplement furnishing vitamins and roughage is thus clearly indicated."

The vitamin A, B, C, and G content of watermelon (Citrullus vulgaris), H. E. Munsell (*Jour. Home Econ., 22 (1930), No. 8, pp. 680–685, figs. 3*).—Studies on the vitamin A, B, C, and G content of the fresh edible portion of watermelons of the Tom Watson variety are reported, with the conclusion that the watermelon is a good source of vitamins A and C and contains a small but detectable amount of vitamins B and G. In the rat-feeding experiments reported, 1 gm. of the watermelon produced an average gain of 22.7 gm.

during the 8-week period in the A tests, and 8 gm. daily furnished as complete protection against scurvy in guinea pigs as did 3 gm. of raw tomato juice.

Vitamins C, D, and E [in avocados], L. Weatherby (*Calif. Avocado Assoc. Yearbook 1930, pp. 100–105*).—This paper, supplementing earlier ones on vitamins A and B (E. S. R., 62, p. 193), summarizes the results obtained in studies of the vitamin C, D, and E content of the California avocado.

In the C studies amounts as low as 0.5 gm. daily prolonged the life of guinea pigs over that of controls on the scorbutic diet alone, but amounts up to 5 gm. daily did not prevent scurvy. On the 5-gm. amount resort had to be made to forced feeding and larger amounts were not tested. These findings indicate that the avocado contains a small amount, but is not a good source, of vitamin C.

In the vitamin D tests the Steenbock-Black rachitic ration was used, and both curative and protective experiments were run. As criteria for the presence or absence of rickets, the line test, blood phosphorus determination, and evidence of rachitic rosary were all used. The conclusion drawn from the summary of findings with respect to these tests is that the avocado contains vitamin D in liberal quantities, although both the rosary and line tests indicated rickets on doses as high as 5 gm. in curative tests and mild rickets on the same dosage in preventive tests. The results with blood phosphorus are reported as normal, but other recent observations have indicated that this is sometimes the case in well-defined rickets. In preventive tests with avocado oil, the results with 2.5 cc. of the oil are given as normal for the rosary and blood phosphorus tests and as traces of rickets in the line tests.

In the vitamin E tests, the sterility diet of Evans was used. When complete sterility was established the test animals were fed varying amounts of avocado or extracted oil in addition to the basal diet. Five gm. of avocado or 7.5 drops of oil were the minimum doses found effective in producing cures in the female rats. Cures were not effected in the males, and preventive measures were not tested.

Observations on a diatom (Nitzschia closterium W. Sm.) as a source of vitamin A, B. Ahmad (*Biochem. Jour., 24 (1930), No. 4, pp. 860–865, figs. 3*).—A reinvestigation of the vitamin A content of the marine diatom *N. closterium* by both colorimetric and biological tests was undertaken on account of the discrepancy in the results previously reported by Jameson, Drummond, and Coward (E. S. R., 47, p. 769) for biological tests and by Drummond and Watson (E. S. R., 48, p. 758) for sulfuric acid color tests, the former being positive and the latter negative.

The organism was grown from 4 to 6 weeks from a pure culture in a modified Miquel nutrient solution and the oil extracted with redistilled ether from the dried material, care being taken throughout the drying and extraction to prevent access of air. In the color tests the technic of Carr and Price was followed in general, although 10 per cent values were obtained from an intensity dilution curve by the technic of Ahmad and Drummond (E. S. R., 64, p. 194).

On account of interference of the pigments the measurement of the blue color was considered to be only approximate, but sufficiently intense to indicate high potency in vitamin A. The biological tests, following the technic of Drummond and Morton (E. S. R., 62, p. 208), likewise showed high activity in vitamin A, 5 mg. being equivalent to 0.005 mg. of pure carotin. Comparing the biological activities of the two substances with their respective yellow colors (10,000 and 300,000 Lovibond units in 10 per cent dilution in a 1-cm. cell), it was estimated that the whole of the biological activity of the oil could be accounted for if 3 per cent of the yellow pigment present was carotin.

It is, therefore, concluded that the greater part of the biological activity of the oil of this diatom is probably due to carotin synthesized by the organism. It is suggested that these diatoms are the ultimate source of vitamin A of the fish liver oils.

Carotene and vitamin A.—The transformation of carotene into vitamin A as shown by a study of the absorption spectra of rat-liver oils, N. S. Capper (*Biochem. Jour., 24 (1930), No. 4, pp. 980–982, fig. 1*).—This is the detailed report of studies noted by Moore (E. S. R., 64, p. 393) concerning the absorption spectra of the liver oils of rats on diets free from vitamin A and with carotin as the only source of vitamin A. In every case the absorption spectra of the liver oils of rats fed on a diet free from vitamin A showed no band in the region of 325$\mu\mu$, while the spectra of the liver oils of rats given in addition either crystalline carotin or substances containing carotin showed selective absorption in this region similar to that of cod-liver oil. Since it has been shown (E. S. R., 64, p. 112) that this band is absent from the absorption spectrum of carotin, it is concluded that the substance responsible, presumably vitamin A, must be synthesized in vivo from carotin.

Vitamin A and carotene, N. S. Capper (*Nature [London], 126 (1930), No. 3183, p. 685*).—This is a brief note announcing that in the chicken the conversion of carotin into colorless vitamin A has been demonstrated in a similar manner to that reported by Moore for rats (E. S. R., 64, p. 393). This is thought to indicate that the ability to convert carotin into colorless vitamin A may hold quite generally throughout the animal kingdom.

Carotene from lettuce and its relation to vitamin A, H. S. Olcovich and H. A. Mattill (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, pp. 240, 241*).—In this brief report the physical and chemical properties of carotin isolated from lettuce leaves are summarized briefly, together with the behavior of the substance as a source of vitamin A in rat feeding experiments.

The carotin was obtained from a methyl alcohol solution of the unsaponifiable fraction of the lipids of the lettuce. After recrystallization from petroleum ether the carotin melted at 179.5 to 180° C. The yield was 200 mg. from approximately 150 kg. of fresh lettuce. It is noted that the form of the crystals of carotin depends upon the solvent from which it is crystallized, although all belong to the hexagonal system. On long standing at room temperature or on heating for 24 hours at 105°, the crystals bleached from the outer edge inward without losing their form or changing in weight. The bleaching was brought about as readily in nitrogen as in air. In solution carotin likewise faded, the rate of fading being very rapid in ethyl oleate and less rapid in ethyl laurate. In ethyl oleate containing 0.1 per cent of hydroquinone the color was fairly stable and still more stable in cottonseed oil.

The crystalline carotin was effective in curing xerophthalmia and promoting resumption of growth in vitamin A-deficient rats. The practical minimum dosage was found to be 0.005 mg. daily, this allowing growth at a rate of at least 2 gm. daily. The fading of the carotin either in crystalline form or solution was accompanied by loss of vitamin A activity. "Carotin is a prooxidant. 0.06 per cent dissolved in an autoxidizable oil shortens its induction period by one-half. It is possible that this property is closely allied to its function as vitamin A."

The relation of bile to the intestinal absorption of vitamin A in the rat, W. and C. L. A. Schmidt (*Calif. Univ. Pub. Physiol., 7 (1930), No. 13, pp. 211–221*).—To determine whether or not the absorption of vitamin A like that of fat is decreased in the absence of bile, rats in the earliest stages of vitamin A deficiency, as determined by the vaginal smear test, were rendered icteric by

ligating and sectioning the common bile duct and were then given small doses of cod-liver oil as a source of vitamin A by mouth or by subcutaneous injection. Control experiments were run to make sure that the operative procedure of opening the abdominal cavity and handling the duodenum did not in itself interfere with the absorption of vitamin A.

Only 50 per cent of the icteric rats responded to cod-liver oil treatment, but in those which did respond it was possible to restore the normal vaginal smear picture and deplete again the storage of vitamin A to a level at which only cornified cells were found in the vaginal smears and a second time to restore the normal condition by giving cod-liver oil by mouth. The authors conclude that vitamin A absorption can take place from the gastrointestinal tract of the rat in the absence of most, if not all, of the bile from the intestines.

Vitamin A deficiency and resistance against a specific infection.—Preliminary report, H. C. A. Lassen (*Jour. Hyg.* [*London*], *30* (*1930*), *No. 3, pp. 300–310*).—Studies on the relation of vitamin A to resistance against spontaneous infections are reviewed, and an investigation is reported leading to the conclusion that the greater susceptibility to spontaneous infection in rats on a vitamin A-free diet also applies to a specific experimental infection.

Young rats were kept on a vitamin A-free diet until after the development of pronounced xerophthalmia and were then inoculated by mouth and by subcutaneous injection with Breslau (paratyphoid) bacilli. Controls on a normal diet were inoculated in the same manner.

The rats on the deficient diet proved much more susceptible than those on the adequate diet, and on autopsy showed specific infections in the regions which are the most frequent sites of spontaneous infection—the lymph glands at the base of the tongue and the submaxillary lymph glands. The animals on the vitamin A-free diet that did survive were able to overcome the infection in the same manner as the controls, although a longer time was required.

Studies in vitamin B (*Brit. Med. Jour., No. 3640* (*1930*), *p. 609*).—A summary of recent studies on the B vitamins at the Lister Institute of Preventive Medicine, as presented in the 1930 report of the governing body of that institution.

The heat-stability of the (antidermatitis, "anti-pellagra") water-soluble vitamin B_2, II, H. Chick and A. M. Copping (*Biochem. Jour., 24* (*1930*), *No. 4, pp. 932–938*).—The conclusions drawn by Chick and Roscoe (E. S. R., 63, p. 710) concerning the instability of vitamin B_2 at high temperatures in alkaline medium were based upon rat growth experiments. Since these were not in accord with those of Reader (E. S. R., 64, p. 195) and of Narayanan and Drummond (E. S. R., 63, p. 709), the authors have extended their investigation of the heat stability of vitamin B_2 to curative tests for rat dermatitis with results which confirm in every respect the previous ones based upon growth, indicating that the vitamin, while stable to heat in acid solution, is destroyed by treatment in alkaline solution (pH 10.3 to 9.6) for 4 hours at 119° C.

Two of the rats which did not respond to the yeast which had been heated in alkaline solution were cured with material furnished by Reader. This material, a solution of marmite autoclaved at 120° at pH 9, not only cured the dermatitis, but, contrary to the results previously reported by Reader, brought about immediate vigorous growth. It is noted that the divergence could be explained if the preparation of vitamin B_1 used in the present study contained Reader's third B factor. Another possible explanation suggested was that the material was originally so rich in vitamin B_2 that after exposure to 120° for an hour in alkaline solution it still contained sufficient vitamin B_2 to cure dermatitis and stimulate growth.

Vitamin C content of three samples of Japan green tea, H. E. Munsell and C. H. Miller (*Jour. Home Econ., 22 (1930), No. 4, pp. 314–316*).—In continuation of the examination of Japan green tea for vitamin C, three other samples were tested as in the previous study (E. S. R., 62, p. 295). In addition a stronger infusion was tested, and in one series the tea was fed in conjunction with cabbage, a good source of vitamin C, to determine the possibility of the tannin exerting a poisonous effect.

One sample of the tea contained detectable but insignificant amounts of vitamin C, another a trace only, and the third no detectable amounts. Since the condition of the guinea pigs fed both tea infusion and cabbage was normal, it is concluded that the symptoms observed in those receiving tea infusion as the only source of vitamin C must have been due to lack of vitamin C rather than to a poisonous effect of tannin.

Vitamin C and the rat's diet, G. A. Hartwell (*Biochem. Jour., 24 (1930), No. 4, pp. 967–972, fig. 1*).—Conflicting views on the necessity for vitamin C in the rat's diet are summarized, and new experimental evidence is reported in confirmation of the view that growth, general condition, and reproduction of rats are not improved by the addition of vitamin C to a synthetic diet supposedly adequate except for this vitamin. Two sources of vitamin C were used, lemon juice and green cabbage leaves. Although the cabbage showed no superiority over the lemon juice as far as growth was concerned, it had a beneficial effect upon reproduction. This was attributed to the presence in raw cabbage of some food factor of importance in breeding which was not present in the lemon juice.

The antiscorbutic vitamin content of some preserved foods, G. MacLeod and L. Booher (*Jour. Home Econ., 22 (1930), No. 7, pp. 588–593*).—The products tested included canned and fresh grapefruit, packaged dates, canned pimiento, canned cranberry sauce, and raw cranberries, the technic followed being that of Sherman, La Mer, and Campbell. The preserved products were of a proprietary brand purchased on the open market.

The canned grapefruit afforded complete protection in daily doses of from 2.2 to 2.8 gm. and the fresh grapefruit and canned pimiento in doses of 2 gm. In Sherman unit values these figures correspond to from 206 to 162 and 227 units per pound, values of the same order of magnitude as those of lemon juice, orange juice, and tomatoes raw or canned.

Definite values for the packaged dates and the cranberries could not be obtained because of the refusal of the animals to eat large enough quantities for the required length of time. From the results obtained, however, it is concluded that these three foods are poor sources of vitamin C, but that the raw cranberry is somewhat richer in it than dates or cranberry sauce.

Scurvy in adults, especially the effect of food rich in vitamin C on blood formation, S. R. Mettier, G. R. Minot, and W. C. Townsend (*Jour. Amer. Med. Assoc., 95 (1930), No. 15, pp. 1089–1093, figs. 4*).—This paper is based upon nine cases of adult scurvy, eight of which were in elderly males subsisting on a limited diet. The one female subject developed scurvy after subsisting for seven years on a diet of crackers and milk originally prescribed for a gastric ulcer. Particular attention was paid to anemia associated with scurvy. In the opinion of the authors this may be due to insufficient red blood cell production as a result of chronic lack of vitamin C. In five cases among the patients observed in the present study a definite rapid increase of reticulocytes occurred following the change to a diet rich in C. In two cases determinations were made of the reticulocytes during successive periods of (1) boiled milk and white flour biscuits, (2) the same with the addition of 6 gm. of iron and ammonium citrate, and (3) the same with 575 cc. daily of

orange juice. The lack of response to the iron medication and the prompt rise in reticulocytes following the orange juice treatment indicated that the anemia was due to lack of vitamin C. This was indicated still further by the failure of liver extract and the success of fresh raw liver pulp in similar tests. Microscopic examination of the bone marrow of one patient before and after the orange juice treatment likewise showed a marked increase in nucleated red blood cells following the orange juice treatment.

Vitamin content of marine plankton, F. S. RUSSELL (*Nature [London], 126 (1930), No. 3178, p. 472*).—The author, in a brief note, calls attention to the papers of Belloc, Fabre, and Simonnet (E. S. R., 64, p. 295) and of Drummond and Gunther (E. S. R., 64, p. 291) on the sterol and vitamin content of marine plankton at different seasons of the year, and states that most of the plankton in the waters near Plymouth, England, live at depths below 10 or 15 meters in April, May, and June, but come almost up to the surface in July, August, and September. This is in harmony with the observations of Belloc et al. that plankton sterols collected in July were active as a source of vitamin D, while those collected in April acquired biological activity only after irradiation.

The specificity of vitamin E for the testis.—I, Relation between vitamins A and E, K. E. MASON (*Jour. Expt. Zool., 55 (1930), No. 1, pp. 101–122*).—On account of the fact that in many studies of the effect of lack of vitamin A upon the reproductive organs of rats, the presence or absence of vitamin E was not taken into consideration, a reinvestigation of the question was undertaken with comparable groups of young rats on diets one of which in each series was deficient in both vitamins A and E and the other in vitamin A alone.

Testicular degeneration similar to, if not identical with, that previously described (E. S. R., 56, p. 464) was observed in all rats in which xerophthalmia and other symptoms of vitamin A deficiency were evident, and the severity of the testicular changes appeared invariably to be in direct proportion to the duration and severity of the eye condition. Supplementing the diet with several times the normal requirement of vitamin E did not protect against these changes.

"These results indicate that both the A and E vitamins are essential for the maintenance of a normal germinal epithelium of the testis. Whether they produce their effect independently or supplement each other in certain metabolic activities of the testis can not be stated."

Cod liver oil for reproduction and lactation, H. O. SMITH and V. E. NELSON (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, p. 393*).—Eight samples of cod-liver oil were tested for vitamin E by fertility records of rats on rations consisting of casein 18, salt mixture 3.7, yeast 12, cod-liver oil from 1 to 5, and dextrin to 100 per cent. The values of the different rations were expressed in terms of the number of young produced per female per month on each ration. On the stock ration this value was 5.4, while on the ration containing cod-liver oil as presumably the only source of vitamin E the values decreased from 1.79 to 0.08. The mortality of the young varied with the kind of oil and the level at which it was administered, but with the oils giving the highest reproduction records was no greater than on the stock ration. A considerable number of females on the various cod-liver oil rations died in pregnancy, but there appeared to be no relation between the mortality of the females and the potency of the oils in vitamin E.

The antirachitic action of cod liver oil and irradiated ergosterol in parathyroidectomized and thymectomized rats, A. M. PAPPENHEIMER (*Jour. Expt. Med., 52 (1930), No. 6, pp. 805–812*).—In this investigation, in which the

author had the assistance of C. L. Buxton, young parathyroidectomized and thymectomized rats were placed on the Steenbock low-phosphorus rickets-producing diet and given cod-liver oil or irradiated ergosterol either from the beginning of the experimental period or after 21 days. In both preventive and curative experiments the two antirachitic agents tested were effective in the absence of the parathyroid gland or thymus or both.

On the nutritive value of the hardened oils.—III, The influence of ultra-violet irradiation on the nutritive value of hardened oils, S. Ueno, M. Yamashita, and Y. Ota (*Jour. Soc. Chem. Indus., Japan, 33 (1930), No. 2, p. 61B*).—Irradiated hydrogenated sardine oil, herring oil, and cod-liver oil were found to have practically the same physical and chemical constants as before irradiation.

The influence of wave length on the irradiation of ergosterol [trans. title], E. Kisch and T. Reiter (*Deut. Med. Wchnschr., 56 (1930), No. 48, pp. 2034–2036*).—Irradiation experiments with filtered light of various wave lengths are reported, with the conclusion that wave lengths less than 280$\mu\mu$ should not be used for the antirachitic activation of ergosterol or substances containing it. In the irradiation of milk, using wave lengths below 280$\mu\mu$, the product had a disagreeable odor and flavor which was not the case when filtered rays above 280$\mu\mu$ were used. Ergosterol-containing products irradiated with wave lengths above 280$\mu\mu$ were found to be more uniform and of greater activity than when irradiated with light of shorter wave lengths. Good results, as manifested chiefly by gains in weight, are reported in the treatment of tuberculous children with ergosterol irradiated with filtered rays of 280$\mu\mu$ or above.

The toxicity of irradiated ergosterol, J. B. Duguid, M. M. Duggan, and J. Gough (*Jour. Path. and Bact., 33 (1930), No. 2, pp. 353–362, figs. 3*).—Evidence is reported showing that irradiated ergosterol is more toxic to rats on a synthetic vitamin-free diet of high calcium content than on a low calcium diet of bread and potatoes. It is emphasized that in preparing a synthetic diet for use in investigating the toxicity of irradiated ergosterol attention should be paid to the calcium content of the diet, and that this requires special caution if casein is one of the ingredients.

Relation of calcium and phosphorus of diet to toxicity of viosterol, D. H. Shelling (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, pp. 298–301*).—This is a preliminary report of an investigation of the effect of excessive doses of viosterol on rats on diets differing in their absolute and relative content of calcium and phosphorus. The diets studied and the effect with each of increasing dosage of viosterol were as follows:

(1) Steenbock-Bills stock diet. Ca=0.515, P=0.450 gm. per cent. On this diet the toxicity, duration of life, and well-being of the animals were directly proportional to the dose of viosterol. Amounts up to 4,000 times the standard were without harmful effects. On 10,000 and 20,000 times overdosage the animals did well at first, but finally died with evidence of calcification of many organs, especially of the vascular system. A dosage of 40,000 to 80,000 times the standard was rapidly fatal, sometimes with little evidence of metastatic calcifications.

(2) Steenbock high calcium, low phosphorus rickets-producing diet. Ca=1.240, P=0.243 gm. per cent. On 2,000 times overdosage, the lives of the rats were prolonged, but on very high dosages life was shortened, with evidence of hypercalcemia but not hypercalcification to any extent.

(3) Optimal phosphorus, low calcium diet. Ca=0.012. P=0.475 gm. per cent. On this diet the animals did not grow well, but survived longer than those on the same amount of phosphorus but high calcium. On large doses

of viosterol the animals developed emaciation, extreme osteoporosis, and high serum calcium. On intermediate doses there were slight calcium deposits in the aorta and kidney.

(4) High calcium, optimal phosphorus. Ca=1.212, P=0.475 gm. per cent. On this the animals died much sooner than on the low calcium diet. The larger the dosage the more rapid the fatal outcome. The animals surviving longer showed marked calcification of various organs in 150 days.

(5) High phosphorus, low calcium diet. Ca=0.012, P=1.780 gm. per cent. Animals on this diet did not grow well, and on the larger doses of viosterol did not survive long and showed moderate calcification. Renal lesions, apparently due to constant excretion of phosphate by way of the urine, were present whether viosterol was administered or not.

(6) High phosphorus, minimal calcium diet. Ca=0.412, P=1.780 gm. per cent. This group was the most susceptible of all to high dosage of viosterol. Even 400 times overdosage was rapidly fatal, with extreme calcification of the kidneys. From these observations the author draws the following conclusions:

"The composition of the diets with respect to their calcium and phosphorus content is a determining factor in the toxicity and hypercalcifying property of viosterol. In the presence of a calcifying agent, increasing the amount of phosphorus in the diet renders the organism more susceptible to hypercalcification. With large doses of viosterol animals on certain diets may die without showing any signs of hypercalcification, although hypercalcemia may be present, while on the other diets they may show hypercalcification without hypercalcemia."

Effect of calcium and phosphorus of diet on tetany and serum calcium of parathyroidectomized rats, D. H. SHELLING (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, pp. 301–303*).—This preliminary report, summarizing the effects of the diets used in the above study on the tetany and serum calcium of parathyroidectomized rats, shows the importance of the calcium and phosphorus of the diet in relation to serum calcium levels after parathyroidectomy. Tetany and low serum calcium concentrations were observed when the animals were on a low calcium intake, and the tetany was alleviated and the serum calcium level rose with increase in calcium intake.

Effect of viosterol on serum calcium of parathyroidectomized rats, D. H. SHELLING (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, pp. 303–305*).—This study is similar to the one noted above except that viosterol in increasing dosage was added to the various diets fed the parathyroidectomized rats. Ordinary doses of viosterol affected only slightly the serum calcium levels, but with higher doses and in the presence of sufficient calcium in the diet normal calcium levels were restored on prolonged treatment.

"These experiments would seem to indicate the independent activity of viosterol. While in a normal animal it may act through and its activity be regulated by the parathyroid glands, in the absence of these glands it may raise the serum calcium level to normal in the presence or absence of a calcium deficiency in the diet, provided large doses are used."

Effect of diet and viosterol on calcium deposition in the callus of parathyroidectomized rats, D. H. SHELLING (*Soc. Expt. Biol. and Med. Proc., 28 (1930), No. 3, pp. 306, 307*).—Further evidence of the importance of sufficient calcium in the diet in correcting parathyroid deficiency is reported in a summary of the results obtained in the healing of experimental fractures in parathyroidectomized rats on the various diets used in the series of studies noted above. The most normal deposition of calcium in the callus occurred on a low phosphorus diet supplemented with 1 per cent calcium carbonate and 500 per cent viosterol.

Rôle of the parathyroids in calcification, and susceptibility of parathyroidectomized rats to viosterol, D. H. SHELLING (*Soc. Expt. Biol. and Med. Proc.*, *28* (*1930*), *No. 3*, *pp. 307–309*).—Referring to reports in the literature and in the series of papers noted above of some of the effects of hypoparathyroidism and extirpation of parathyroids upon calcium and phosphorus metabolism, the possible relation of hypoparathyroidism to abnormal calcification as in Paget's disease, juvenile sclerosis, renal sclerosis, otosclerosis, and general arteriosclerosis is suggested as being worthy of consideration. "The rôle of the parathyroids and high phosphorus diets, such as meat, in general arteriosclerosis of the middle aged can only be speculated upon at present."

Nutritional anemia: A review of recent literature, S. L. SMITH (*Jour. Home Econ.*, *22* (*1930*), *Nos. 5*, *pp. 365–372*; *6*, *pp. 467–474*).—A review and discussion of recent literature on the subject, with a list of 51 references.

An improved method for the study of nutritional anemia in the white rat, W. B. NEVENS and D. D. SHAW (*Science*, *72* (*1930*), *No. 1862*, *pp. 249–251*, *figs. 5*).—A study of the factors responsible for delay in the onset of anemia in rats on a milk diet is reported briefly, with suggested technic for overcoming these difficulties. Having found that enough minerals may sometimes be secured from ordinary cages to protect against anemia and that access to feces delays the onset, the authors devised a special cage, the floor and roof of which were glass rods, the sides of window glass, and the framework of wood. The whole milk used is obtained by milking directly into a glass funnel in a glass jug. The milk is fed daily and the paired feeding method employed, one animal receiving milk alone and its litter mate of the same sex and weight the same amount of milk with the material to be tested.

Beriberi and other food-deficiency diseases in Newfoundland and Labrador, W. R. AYKROYD (*Jour. Hyg.* [*London*], *30* (*1930*), *No. 3*, *pp. 357–386*, *figs. 4*).—This report, which is devoted chiefly to a discussion of the etiology and symptoms of beriberi in Newfoundland and Labrador, is based on information supplied by physicians long resident in these countries and on inspection of hospital records while the author was serving as house surgeon at the General Hospital, St. John's, Newfoundland.

The main cause of beriberi in these localities is considered to be the almost exclusive use of white flour during the winter months by families who have grown few vegetables and shot little game. Tables are given of the food supplies for six or seven months of several families in north Newfoundland and Labrador in which one or more cases of beriberi occurred and in a corresponding number of families remaining free from beriberi. The main deficiency is thought to be vitamin B_1, although the diets of patients suffering from beriberi are deficient in other respects.

Considering other food deficiency diseases, severe scurvy and rickets are not often met. The comparative freedom from scurvy is attributed chiefly to the abundant use of native cranberries which are eaten raw or lightly stewed, and of rickets to the abundant sunshine and to the habit of using homemade cod-liver oil. Dental caries is widespread and severe except among Eskimos who have retained their traditional habits and live entirely on fresh meat and fish. Functional hemeralopia or night blindness occurs frequently among men on fishing trips when the diet is low in vitamin A and is promptly relieved by cod-liver oil or other vitamin A-containing foods. Tuberculosis, functional stomach complaints, and constipation are common, but gastric and duodenal ulcers, diabetes, and obesity are rare.

The blacktongue preventive value of Minot's liver extract, J. GOLDBERGER and W. H. SEBRELL (*Pub. Health Rpts.* [*U. S.*], *45* (*1930*), *No. 50*, *pp. 3064–3070*).—Minot's liver extract No. 343 for the treatment of pernicious anemia was

found to have a definite prophylactic and curative effect for blacktongue in dogs when fed in daily doses equivalent to 100 gm. of fresh liver. It is concluded that the extract "is a fairly good source of the antipellagric vitamin, and given in larger quantity would be of value as a temporary expedient in the treatment of pellagra."

The future of the diabetic child, P. White (*Jour. Amer. Med. Assoc.*, *95* (*1930*), *No. 16*, *pp. 1160–1162*).—The principal points brought out in this discussion, based upon the author's experience in the Joslin diabetic unit, New England Deaconess Hospital, are summarized as follows:

"The diabetic child has taught us lessons of great importance: First, that heredity is an undoubted etiologic factor in diabetes; second, that the child affords new evidence to the theory that overnutrition is a precursor of diabetes; and third, that cataracts and arteriosclerosis can occur in pure diabetes under the age of 20 years. Nevertheless, the possibilities of combating the taint of heredity and an environment producing maximum growth are apparent, while the evidence of the decreasing severity of diabetes, the absence of its complications in the child treated with insulin from the very onset, and the actual lack of organic disease of the pancreas offer limitless hope for the future of the diabetic child."

A note on the incidence of endemic goiter in Northern Ireland, R. Olesen and P. A. Neal (*Pub. Health Rpts.* [*U. S.*], *45* (*1930*), *No. 44*, *pp. 2669–2672*, *fig. 1*).—During the routine physical and mental examinations at Belfast of applicants for visas to enter the United States from Northern Ireland, the authors examined between July, 1929, and June, 1930, the thyroid glands of 4,648 male and 3,992 female applicants. The methods of examining and classifying thyroid enlargements were the same as in previous studies (E. S. R., 53, p. 663). In all, 552 definite thyroid enlargements were found among the males and 1,095 among the females. The enlargements were not only more numerous but of greater size among the females than the males. The incidence was higher in both sexes between the ages of 15 and 24 years, after which there was a comparatively rapid decline in incidence among the males but a continued prevalence to some extent among the females even after the age of 50.

The relatively high incidence of goiter, at least among females, in Northern Ireland is considered of particular interest on account of the proximity of the ocean to this territory.

Considerations leading to the view that pellagra is an iron-deficiency disease, S. Bliss (*Science*, *72* (*1930*), *No. 1875*, *pp. 577, 578*).—In this contribution from the School of Medicine, Tulane University, the theory is advanced that pellagra is caused by a deficiency of iron rather than of an antipellagric vitamin in the diet. Among the arguments upon which this theory is based are (1) that the diets reported by Goldberger and his associates as having curative effects for both pellagra and blacktongue in dogs all contained "syrup iodid of iron U. S. P.," (2) that foods which are supposed to contain liberal quantities of vitamin G (beef, liver, egg yolk, and yeast) are all iron-containing, while the pellagra-producing diet of poor farmers of the South (molasses and corn bread) is deficient in iron, (3) that anemia is frequently associated with pellagra, and (4) that encouraging results have been obtained in the treatment of human pellagra and blacktongue in dogs with iron administered intravenously.

Some factors involved in the experimental production of pellagra in rats.—I, Preliminary, V. R. Leader (*Biochem. Jour.*, *24* (*1930*), *No. 4*, *pp. 1172–1180*, *figs. 3*).—In an attempt to establish a routine procedure for the experimental production of pellagra in rats, the author fed a group of 31

rats a basal diet of vitamin-free casein 23, cane sugar 17, rice starch 40, palm kernel oil 15, and salt mixture (McCollum and Davis) 5 per cent until the onset of polyneuritic symptoms, which occurred in from 15 to 20 days. The animals were then divided into five groups and given in addition to the basal diet 0.75, 0.5, 0.5, 0.25, and 0.125 cc., respectively, of marmite extract daily. The marmite was fed separately from the basal ration except in one of the two groups receiving 0.5 cc. In this group the marmite was incorporated in the daily ration and, since some food was left each day, the intake was rather less in this group than in the others. On 0.5 cc. or somewhat less of the marmite, growth was good, although slightly irregular. Protection against polyneuritis for a comparatively long period was secured with as little as 0.25 cc., but 0.75 cc. was required to prevent the onset of skin lesions. Pellagra occurred even when growth was good.

It was found almost impossible to produce pellagra in rats in the months of December, January, and February, thus indicating that the well-known seasonal incidence of human pellagra is also characteristic of the rat disease.

On eliminating sugar from the basal diet and replacing it with an equivalent amount of starch, it was found impossible to induce pellagra, although polyneuritis developed on the 0.25-cc. dosage of marmite which had been the border line dosage in the previous tests. Growth, however, was practically stationary. After 21 weeks on the sugar-free diet, the surviving rats were given the usual sugar-containing diet with the same amount of marmite. The polyneuritic symptoms remained about the same, but pellagra developed in about 11 days. Increasing the amount of sugar from 17 to 29 and even 57 per cent did not hasten the onset of pellagra, although the general condition and growth of the animals were not as satisfactory.

In discussing the significance of these findings, the author calls attention to the fact that when corn is used for human consumption it is almost always accompanied by either cane sugar, sirup, or molasses and that cures of human pellagra have been noted on removal of the sugars from the diet. The frequent absence of pellagra when growth has failed and polyneuritis develops later is discussed, with the suggestion that the actual occurrence of polyneuritis may be inhibitory to the development of pellagra. "If the suggestion should prove permissible that beriberi inhibits to some extent the development of pellagra, it may explain the infrequency of the latter disease amongst rice-eating communities where beriberi is rife."

The effect of phosphorus in rickets.—I, Roentgenologic changes in rickets following administration of phosphorus. II, Chemical changes in the blood in rickets following administration of phosphorus, E. L. Compere (*Amer. Jour. Diseases Children, 40 (1930), Nos. 5, pp. 941–967, figs. 11; 6, pp. 1177–1192, figs. 4*).—In these two papers the author reports, respectively, upon the Röntgenographic changes in the bones and the chemical changes in the blood of 1 nonrachitic and 10 rachitic infants following the administration of cod-liver oil, elementary phosphorus, or a combination of the two. The studies were begun and completed during the fall, winter, and spring seasons and were thus not complicated by spontaneous healing in the summer months.

The evidence along both lines indicated that phosphorus alone was incapable of bringing about healing in severe cases of infantile rickets in which there had been no initial stimulation from ultra-violet light or from cod-liver oil, but that in suitable dosage (2 one-hundredth grain pills each day) in conjunction with cod-liver oil healing of rickets was more prompt and certain than with cod-liver oil alone.

The findings are discussed with reference to previous conflicting evidence on the efficacy of elementary phosphorus in the treatment of rickets.

Is it possible to produce experimental rickets in the guinea pig? [trans. title] L. RANDOIN and R. LECOQ (*Compt. Rend. Acad. Sci.* [*Paris*], *191* (*1930*), *No. 17, pp. 732–734*).—Attempts to produce rachitic lesions in guinea pigs by various synthetic diets deficient in calcium and too rich in phosphorus, or vice versa, were unsuccessful. The animals were unable to withstand for long the disproportionate calcium-phosphorus balance of the diets used and died abruptly, but with no symptoms of rickets. The introduction of vitamin D into the diet, moreover, did not prevent the fatal outcome.

Induction of tetany in rachitic rats by means of a normal diet, A. F. HESS, M. WEINSTOCK, H. R. BENJAMIN, and J. GROSS (*Soc. Expt. Biol. and Med. Proc.*, *28* (*1930*), *No. 3, pp. 272–274*).—In attempting to throw light upon the almost invariable sequence of tetany following infantile rickets, the authors induced rickets in young rats by feeding them the McCollum high calcium-low phosphorus (4 : 1) diet and then changed the diet to the Sherman B diet of one-third dry milk, two-thirds whole wheat plus sodium chloride. This diet has a Ca : P ratio of 0.67 : 1. After a period of from 1 to 4 days, the calcium concentration of the blood had fallen from 10 mg. to about 6 mg. per 100 cc., the inorganic phosphate had risen from 3 to 8 or 10 mg., and some of the animals showed definite symptoms of tetany. On continuing the diet for a week or more, the calcium rose to normal and the phosphate receded to its previous level, although more slowly. The animals lost no weight, and radiographs showed definite healing even after an interval of 2 days or less. The same phenomena could be induced in rachitic rats on other combinations of calcium and phosphorus and with greater absolute amounts of phosphorus, but in all cases with a ratio of Ca : P less than the original 4 : 1 of the rachitic diet.

It was concluded that the tetany did not result from giving a ration in which phosphorus was relatively high compared to calcium or high in absolute amount. "The sudden fall of calcium in the blood with the accompanying symptoms seemed rather to be the reaction to the sudden change of the Ca : P ratio as compared to the high ratio of (4 : 1) which characterized the rickets-producing diet. This sudden change, associated with healing of the rickets, evidently so disturbed the Ca : P balance in the body that the calcium concentration in the blood could no longer maintain its level and hyperirritability of the nervous system followed."

Cure of rickets by water soluble extract of yeast and sodium phosphate, C. A. LILLY and L. H. NEWBURGH (*Soc. Expt. Biol. and Med. Proc.*, *28* (*1931*), *No. 4, pp. 456, 457*).—In this preliminary report the announcement is made that severe rickets induced in rats by the use of the Steenbock rachitic diet 2965 has been cured by the addition to the diet of secondary sodium phosphate, $Na_2HPO_4.12H_2O$, in the proportion of 1 part to 24 of the diet and a sterol-free water-soluble extract of brewers' yeast.

Increased resistance of rachitic rats exposed to sunlight through Vita glass, J. R. ROSS and E. C. ROBERTSON (*Soc. Expt. Biol. and Med. Proc.*, *28* (*1931*), *No. 4, pp. 443–445*).—Rats on a rachitic diet and exposed for 2-hour intervals daily to sunlight through Vitaglass showed greater resistance to infection by mouth with *Salmonella muriotitis* than did similar rats receiving the same amount of sunshine through ordinary glass. Of 41 rats exposed to sunlight through Vitaglass, 61 per cent survived the infection as compared with 28 per cent of 32 rats exposed to sunshine through ordinary glass.

Seasonal variation in efficiency of New Orleans sunshine and skyshine in preventing and curing rickets in rats, H. S. MAYERSON and H. LAURENS (*Soc. Expt. Biol. and Med. Proc.*, *27* (*1930*), *No. 9, p. 1070*).—This is a prelimi-

nary report of determinations of the time of exposure to sunlight or skylight required to protect rats against rickets at different seasons of the year in New Orleans. The rats fed the Steenbock-Black rickets-producing diet were exposed from the time of weaning to sunshine or skyshine for varying lengths of time between 10 a. m. and 1 p. m. The duration of the experiment was usually 5 weeks, but was occasionally prolonged when the controls did not show florid rickets within that time. The diagnosis was based on line tests, Röntgenograms, and blood phosphorus determinations.

During June, 1929, an average daily exposure to sunshine for 3 minutes prevented rickets, during July 9.5, and October 5 minutes. Shorter periods were not tested. From November 16 to December 20, exposure for 10 minutes afforded protection but 5 minutes did not. From December 5 to January 17 exposure for 14 minutes daily and from January 17 to March 31 from 2 to 5 minutes did not afford complete protection. An average exposure of 6 minutes daily from March 29 to May 1 was completely protective.

During June, 1929, an average exposure to skyshine for 8 minutes daily was insufficient, during July 24 minutes barely protective, and 48 minutes completely protective. During October, November, and December protection was secured with exposures of 22 to 24 minutes daily and from January 3 to February 14 of 67 minutes. From February 10 to March 24 incomplete protection was afforded by 28 minutes' exposure and during April 47 minutes barely protected.

New concepts concerning the pathogenesis of obesity and the problems of basal metabolism, H. Bernhardt (*Endocrinology, 14 (1930), No. 4, pp. 209–225, figs. 2*).—In this paper, read at the annual meeting of the Association for the Study of Internal Secretions at Detroit, Mich., June 24, 1930, the author presents his views concerning the etiology and treatment of obesity and offers an explanation based upon his own investigations of the failure of certain obese patients to lose weight even on a strict diet.

Metabolic rate determinations of obese subjects at intervals through the day have led to the conclusion that there are periods during the day, particularly after light muscular work and often during sleep, when the basal metabolic rate sinks markedly below the value obtained in the morning under the usual conditions. Under such conditions a diet based upon the basal metabolic rate plus the caloric amount necessary for muscular exercise plus that of the specific dynamic action of food will furnish an excess of calories over the maintenance requirement.

The metabolism of obesity.—VII, The after-effect of muscular exercise on the production of basal heat, C. C. Wang, S. Strouse, and E. Smith (*Arch. Int. Med., 46 (1930), No. 1, pp. 40–45*).—This study was undertaken to answer the question as to whether the 30-minute rest period commonly used before basal metabolism determinations is sufficient for obese and underweight subjects and for those who have had vigorous exercise immediately before the 30 minutes' rest. Forty-one experiments consisting of four tests each were conducted on 35 women, 13 of whom were obese, 15 normal, and 7 underweight. All of the experiments were performed in the postabsorptive condition. Following a 30-minute rest period, the basal test of 10 minutes' duration was taken. This was followed by another test made while the subject was riding the bicycle ergometer (E. S. R., 64, p. 392) for from 3.5 to 6.2 minutes at a speed of 120 r. p. m. with a load of about 6 lbs. The third test was made 15 and the fourth 30 minutes after the exercise.

"The average values for the production of heat 15 minutes after muscular exercise were +6.5, +3.1, and +6.8 per cent above the basal value for the

obese, normal, and underweight subjects, respectively. The corresponding values 30 minutes after the exercise were +0.9, +0.8, and −0.1 per cent. The lowered production of heat after exercise was accompanied by a lowered respiratory quotient. Based on our observations, a 30-minute rest served as an adequate resting period for the measurement of the production of basal heat."

Iodine prophylaxis and endemic goitre, A. T. CAMERON (*Canad. Pub. Health Jour., 21 (1930), Nos. 10, pp. 495–506, figs. 2; 11, pp. 541–548*).—This is a general discussion of the literature on (1) the distribution of iodine in nature and the correlation of that distribution with thyroid diseases and in particular with simple endemic goiter and (2) the different methods of administration of iodine. Included in the discussion of distribution are tables on the relative distribution of iodine in foods and content in human urine in nongoitrous and goitrous districts. In discussing the controversy on the use of iodized salt, the conclusion is drawn that it is the best medium for iodine prophylaxis, but that the amount of iodide added in Canadian iodized salt is perhaps from 10 to 20 times greater than necessary. Concerning the compulsory iodization of salt and the possible danger involved in the use of iodized salt by adult goitrous individuals, the following statement is made:

"There is overwhelming evidence that this salt would, if its use were compulsory, in time practically banish endemic goiter from communities using it. There is some slight evidence, by no means perfect, that a very small percentage of nontoxic goiters may develop a hyperthyroid condition through the use of the salt. Compulsory use will, therefore, produce great good and little harm. If use is left to the caprice of a mass of individuals of varying intelligence, less good and probably not much less harm will accrue." The suggestion is made that "in all regions where goiter is endemic, all salt sold commercially for table and culinary purposes should be iodized, but that noniodized salt should be procurable under restricted conditions."

MISCELLANEOUS

Classified list of projects of the agricultural experiment stations, 1930 (*U. S. Dept. Agr., Misc. Pub. 89 (1930), pp. 252*).—This is a revision of the mimeographed list previously noted (E. S. R., 59, p. 796).

***Fifty-third Report of the Connecticut Agricultural Experiment Station,* 1929,** W. L. SLATE ET AL. (*Connecticut State Sta. Rpt. 1929, pp. XIII+926+LXI, pls. 38, figs. 84*).—This contains the organization list, a report of the board of control for the year ended October 31, 1929, a financial statement for the fiscal year ended June 30, 1929, and reprints of Bulletins 308–320, previously noted, and of the following Circulars, which continue the series of Bulletins of Immediate Information: Nos. 68, The European Corn Borer Quarantine and Clean-up Regulations, by W. E. Britton; 69, European Black Currants Outlawed, and 70, Nursery Sanitation Zones, White Pine Blister Rust Control, both by J. E. Riley, jr.; 71, Regulations Concerning the Transportation of Nursery Stock in the United States and Canada, compiled by W. E. Britton; and 72, Quarantine Regulations Affecting the Transportation of Nursery Stock in Connecticut, by W. E. Britton.

Information regarding recent publications (*Kansas Sta. Circ. 157 (1930), pp. 3*).—This circular briefly describes Bulletins 249 and 250 and Circulars 150–156, previously noted.

NOTES

Mississippi Station.—Dr. Rowland Cowart, associate agronomist, has returned to the station after a five years' leave of absence spent in study at the Universities of Illinois and Wisconsin. Dr. C. B. Cain, head of the animal husbandry department, has been granted a two years' leave of absence, effective February 1, for graduate study. H. H. Leveck has been appointed acting head of the department during his absence.

T. N. Jones was appointed agricultural engineer January 1, succeeding J. W. Carpenter, jr., resigned to accept a position at the Oklahoma College. J. L. Cooley, jr., has been transferred from the South Mississippi Substation at Poplarville to Natchez Substation.

Rutgers University and New Jersey Stations.—Robert G. Connelly, associate extension dairyman, has resigned. Recent appointments include Dr. William G. Meal as extension economist in marketing; Abraham Kamarov, V. M. D., as assistant poultryman; and Friar M. Thompson, jr., as research assistant under a pine oil fellowship.

Cornell University.—Plans have been completed for the new home economics building. This will be in its main portion a 7-story structure, with 5-story wings. The ground floor will contain a cafeteria, two dining rooms, a kitchen, a bake shop, various offices, the household management and psychological laboratories, classrooms, and a men's study. Other parts of the structure will house an amphitheater and auditorium and extensive laboratories for work in clothing, foods, and related subjects. There will be numerous practice apartments and other equipment. The cost will be defrayed from a State appropriation of $985,000.

New York State Station.—Dr. H. J. Conn, chief in research (soil bacteriology), has been granted six months' sabbatical leave beginning April 1. He expects to spend much of this time in a survey of microbiological research under way in the experiment stations in this country.

West Virginia University and Station.—An attendance of more than 750 farm men and women at the twenty-third annual farm and home week of the College of Agriculture was considered gratifying in view of the strained financial conditions resulting from the widespread drought of the past season. Forty-four of the State's 55 counties were represented at the 3-day session. Three farmers and five farm women received degrees of master farmer or master farm home maker, awarded by farm and home magazines. An exhibit of especial interest to visitors was an exact replica of the original reaper, invented 100 years ago by Cyrus Hall McCormick.

In the recently established graduate school of the university, Dr. F. D. Fromme, dean of the College of Agriculture and director of the station, has been made chairman of the biological science group of research and instruction. Social science, industrial science, and education constitute the three other groups comprising the school. Under the new organization the degree of doctor of philosophy will be granted, and extensive research is contemplated. Nearly all of the departments of the College of Agriculture are associated with the biological science group, which in point of number of faculty members is the largest of the four groups.

EXPERIMENT STATION RECORD

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EDITORIAL

TWO RECENT HISTORIES OF ECONOMIC ENTOMOLOGY

The steadily lengthening list of publications dealing with the development of agricultural science and its various branches has been materially augmented by the recent appearance of two comprehensive accounts of the growth of what is generally known as economic entomology. One of these narratives is from the pen of Dr. L. O. Howard, for many years chief of the Federal Bureau of Entomology, and associated with the entomological work of the Department for over 52 years. Throughout this long period Dr. Howard has maintained more or less close relations with entomologists all over the world, and he has accumulated in consequence a store of information of exceptional range and interest. It is from this wealth of experiences and impressions that the material for what he has termed A History of Applied Entomology (Somewhat Anecdotal) has been largely drawn, and in no small degree it is because of these personal touches by the author that there has resulted not only an important and useful contribution to the literature but one which will be generally read and enjoyed.

In the words of a review in the *Journal of Economic Entomology* by Dr. E. P. Felt, what Dr. Howard has produced is a volume " very different from the ordinary history of the development of a science. It is a history written by one who has served as a Government entomologist for more than 50 years and therefore possesses a unique fund of information based upon personal contacts and observations. The author gives in a most attractive manner many details which rarely find their way into print. The work is particularly delightful on account of the well presented human phases of the subject. It is a history in a way of the activities and reactions of many of the author's acquaintances through a long series of years. It has been his good fortune to be associated intimately with the leaders in his chosen science, not only of this country but in other sections of the world, and the results make an exceedingly readable story."

Admitting with Dr. Howard himself that his account is "not a history of the strict, modern, documented type," it is what is far more unique and perhaps of even greater value for many purposes, an intensely human delineation of what has been done to build up economic entomology and the men who have done it. Without derogation of institutions, it emphasizes to a striking degree the not always comprehended truth that fruitful research and worth-while instruction are fundamentally the achievements of individuals. Particularly does this seem to be apparent in the more picturesque pioneer stages of a science. Dr. Howard's narrative is a conspicuous recognition of a world of flesh-and-blood men and women with strengths and weaknesses, of disappointments as well as achievements. In its pages the figures of T. W. Harris, Townend Glover, B. D. Walsh, Asa Fitch, C. V. Riley, H. A. Hagen, and a host of others live again. So too, his wide acquaintance with entomologists in foreign countries has enabled him to characterize many of them in their personal as well as professional aspects. This information is effectively supplemented by a series of 51 plates showing portraits of more than 250 early entomologists and the later workers abroad.

Under the title of A History of Entomology, Prof. E. O. Essig of the California University and Station has compiled a work of over 1,000 pages of quite different scope and content. Whereas Dr. Howard has devoted considerably more than half his space to happenings outside the borders of the United States, Prof. Essig has written largely from the special viewpoint of developments in the State of California. Originally, he tells us, his work was intended to embrace only western entomology, and while as ultimately completed it includes chapters on biography and chronology of much wider compass, he has otherwise confined himself closely to the more restricted field, "partly because the historical development of the science is much less known in the West than in the other parts of the country."

Prof. Essig points out that prior to the advent of European civilization there existed only fragments of a more or less specialized type of native agriculture among the Indians of the Eastern and Southern States, and that there was not even this sort of development along the Pacific coast. "Aside from the production of corn, beans, and squashes, it was necessary to create an entirely new agriculture, and North America rapidly became, and still is, perhaps the most gigantic experiment station in the world. The Spanish introduced plants and animals from the temperate, tropical, and subtropical regions of the vast Spanish domains. The English and others from northern Europe brought seeds of cereals, vegetables, herbs, flowers, forage crops, and plants from their respective coun-

tries, while the gaps were supplied by the emigrant representatives from all other parts of the world."

Entomology, he goes on to show, had most interesting relations to this program. "Native species of insects were and still are numerous in this country. The transformation of the wild lands to agricultural uses has forced a large number of these indigenous forms to move over on to the introduced crops and not a few have become pests. However, many of the most important economic insects, whether injurious or beneficial, have, like the hosts upon which they subsist, been introduced from the four corners of the earth. Some of these, such as the gipsy and brown-tail moths, cotton boll weevil, Japanese beetle, European corn borer, cottony cushion scale, pear thrips, San Jose scale, and a host of others, were apparently of little consequence until they were transplanted to our shores." To the emergencies resulting from their attacks are attributed the development of economic entomology, particularly through the Federal Division (later the Bureau) of Entomology and the entomological departments of the agricultural colleges and experiment stations.

Both histories naturally devote considerable space to the way in which this development has been effected. That it is of comparatively recent date is indicated by a statement of Dr. Howard that "the crops of the early colonists in America apparently did not suffer seriously from the attacks of insects," and that from 1771 until 1880, despite the introduction about the time of the Revolutionary War of such pests as the Hessian fly, the codling moth, and the Angoumois grain moth, as well as of serious outbreaks of such native species as the chinch bug, the 17-year locust, and the forest tent caterpillar, "there were only 60 men in the whole of North America who wrote worthwhile notes or articles on injurious insects. . . . Between 1771 and the outbreak of the Civil War there were only 23 such writers. . . . Comparatively few of these writers were competent entomologists. Some were farmers or fruit growers, others were physicians, and others were teachers. None received compensation for their work until T. W. Harris was given a small sum for the preparation of a report on the injurious insects of Massachusetts in 1841; and the first official entomologist to be appointed was Asa Fitch in New York in 1853; T. Glover received the first Federal appointment in 1854."

In the arrangement of Dr. Howard's material, a plan which may be characterized as mainly geographical has been followed. The first 200 pages are given over to North America. Parts 2 to 6 embrace 262 pages devoted to the remainder of the world, while 79 pages are utilized in a discussion of medical entomology, the international use of parasites, and other matters in part 7. This arrange-

ment has numerous advantages, and in the case of most of the foreign countries seems to provide as complete a résumé as could reasonably be expected with the space limitations. Much of this material has been hitherto available to few American workers and can not fail to be of great interest and value. As Dr. Cockerell has said in his discriminating and appreciative review in *Science*, "we in this country may well feel grateful for so much concerning men and measures abroad," but, as he has also pointed out, there has also been encountered "a certain danger, very frankly recognized by the author, that foreigners may not adequately appreciate the work of the United States."

This danger is perhaps most serious as regards the State experiment stations, reference to which in a collective way is restricted mainly to a section of less than four pages entitled The Hatch Act and the State Agricultural Experiment Stations. Obviously, this space is inadequate for even generalizations as to the work of about 50 institutions, extending through a period of over 40 years in a field like economic entomology, generally recognized by these institutions as among their most urgent and important and in consequence long and intensively cultivated. It should not be forgotten, however, that Dr. Howard's treatment of his theme is predominantly on an individualistic rather than an institutional basis, and that scattered here and there throughout the book are many other references to station entomologists, as in the 8-page section on the teaching of entomology in the United States, and the discussion of various specific insects and what has been learned as to their control.

Dr. True in his History of Agricultural Education notes that in 1888, the year following the passage of the Hatch Act, there were already 25 men doing entomological work in 20 experiment stations, while by 1894 the stations in 42 States and Territories were employing 28 entomologists and 49 others doing entomological work in connection with zoology, botany, horticulture, and other subjects. The most recent list of workers in the agricultural colleges and experiment stations, issued in 1931, reveals no fewer than 148 whole-time and 101 part-time entomologists in the experiment stations at the present time.

The Classified List of Projects of the Agricultural Experiment Stations for 1930, recently prepared by the Office of Experiment Stations, includes a total of 7,019 active station projects, of which 521 were in entomology, or over 10 projects per individual station. It appears that 55 of these projects are supported in whole or in part from the Adams funds and constitute about 13 per cent of all the Adams fund projects, indicating that considerable attention is

being given to the most fundamental type of investigations. An examination of some of the project titles tends to confirm this view. Mention may be made of such general studies as the following: The equilibrium of insect populations on the basis of biotic and environmental resistance, relation of temperature to insect life, the ingestion of poison by the cotton boll weevil, the physical and chemical properties of insecticides and fungicides, and the physiology of insects in relation to their control.

That these investigations have been productive is indicated by a compilation made in this Office and cited by Dr. Howard which shows that between 1907 and 1928 there were 2,877 contributions on entomology from the State and insular experiment stations. This total is rendered somewhat less impressive when Prof. Essig tells us that Dr. Howard alone has contributed during his career the amazing total of 941 titles, but it is none the less highly creditable.

Still another measure of effectiveness is suggested in the recent report of the Survey of Land-Grant Colleges and Universities. In this report 35 examples submitted as outstanding achievements by 21 of these institutions are estimated to have contributed in the year 1928 alone a total of $99,739,000 in economic value to the agricultural industry of the Nation as the result of the application of new methods developed by agricultural research for the control of insect pests. All this lends weight to Dr. Howard's statement that during the past 30 years "not only have the States brought out a great mass of valuable results, but that in comparison this mass has equaled in importance that coming from Federal laboratories," and to his prophecy that "the day will come when a record of the valuable work done in each State organization will fill a book as big as this one."

In the case of California, a restricted view of what has been accomplished is afforded by Prof. Essig's brief chapter on principal institutions in California featuring entomology. This account deals with the work at Pomona College by A. J. Cook and C. F. Baker, at Stanford University by J. H. Comstock, Vernon L. Kellogg, and their associates, and at the University of California and its experiment stations by a long list of entomological workers headed by Prof. C. W. Woodworth, associated with the institution from 1891 until 1930. It is of interest to note from this account that entomological work was carried on by the California Station at an early period, beginning with an investigation of the phylloxera situation in 1878 by Director E. W. Hilgard in person and his detail of Mr. F. W. Morse, then a chemist in the College of Agriculture, to make field studies of that insect in the same year. Special instruction to students was begun in 1882, and in 1887 the legislature required the

teaching of economic entomology in the public schools. During the decade preceding the passage of the Hatch Act, many efforts were made to establish a professorship of entomology in the College of Agriculture, both by legislative action and private endowment, and while these were unsuccessful, publications on insecticides for fruit trees were put out by Director Hilgard and a bulletin on the control of woolly aphis by W. G. Klee, and considerable was learned as to resistance of wheat varieties to Hessian fly and the efficiency of band treatment and various arsenicals for codling moth, while useful analyses of insecticides were made by the station horticulturist, E. J. Wickson. In 1887 announcement by the station of the availability of hydrocyanic acid gas as a fumigant for destroying scale insects on citrus trees proved of great advantage to growers confronted with "a process for which private parties proposed to exact royalties."

Despite the omission of most of the younger American workers by Dr. Howard and of many eminent entomologists not included by Prof. Essig because not active in the western field, the biographical portions of both their histories are doubtless among their most useful as well as their most attractive features. Prof. Essig's chapter, occupying nearly one-third of his book, is particularly rich in detail as to specific contributions and publications. Dr. Howard's data deal with over 1,400 individuals, more or less scattered throughout the volume but enlivened by many personal reminiscences and embellished by numerous well-deserved and gracefully worded expressions of appreciation. Significant among these are his references to the early teachers in applied entomology—C. H. Fernald in Massachusetts, Comstock at Cornell, Cook in Michigan, Forbes in Illinois, Popenoe in Kansas, Bruner in Nebraska, and J. B. Smith in New Jersey. He points out that although these men were "distinctly self-trained and self-educated in entomology," they exerted a far-reaching and long-enduring influence in the development of teachers and investigators, and did much to compel recognition of the soundness and fundamental value of "applied" science in a day when to many the barrier between this and the so-called "pure science" often seemed well-nigh insurmountable.

Dr. Howard concludes his prefatory statement with the hope that his history "will be useful, and I think that most entomologists will thank the Smithsonian Institution for publishing it." This statement is entirely too modest, for its inspiration as well as its information should be felt and appreciated not only in entomology but throughout the entire range of agricultural science. Prof. Essig's book, too, will have a wide appeal and usefulness. It is an interesting coincidence that the two works have appeared at substantially the same time. Both fill a real need, and each renders a distinctive service.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Effects of storage on alcoholic extracts of plant tissues.—Amino acid changes, J. E. WEBSTER (*Plant Physiol., 4 (1929), No. 1, pp. 141–144, fig. 1*).—In the words of the author of this contribution from the Oklahoma Experiment Station, "we are able to conclude from this work that there are some possibly many, changes taking place when alcoholic solutions are stored for long periods; if this applies as well when the solutions are allowed to remain in contact with the plant material, we must be very careful in drawing conclusions from the analysis of such samples."

The samples were prepared by boiling the green plant tissue in aldehyde-free 95 per cent alcohol to which had been added an excess of calcium carbonate. The material was boiled one-half hour, cooled, and filtered. The first two extracts were made from commercial spinach, "a small amount" of potassium nitrate was added to one of these before filtering, and the solutions were placed in storage in a warm place exposed to sunlight in January. The second pair of extracts was similarly prepared from spinach in August, 1 gm. of asparagine being added to 1,800 cc. of the solution in the case of one of the last-named pair of samples. Both these last-named solutions were stored in the dark until examined. A fifth extract was made from young alfalfa. A loss of amino nitrogen was evident in each case.

Storage of truck crops: The girasole, Helianthus tuberosus, H. P. TRAUB, C. J. THOR, J. J. WILLAMAN, and R. OLIVER (*Plant Physiol., 4 (1929), No. 1, pp. 123–134, figs. 4*).—Tubers of the girasole (Jerusalem-artichoke) were successfully stored, both as a truck crop and for propagation stock, at the Minnesota Experiment Station in the temperature range 32–35°F. at a relative humidity of from 89 to 92 per cent, under which conditions the tubers showed a larger content of water-soluble carbohydrates, on the basis of green weight, than did tubers left over winter in the ground. At storage temperatures above 40°, however, the tubers lost moisture rapidly, shriveled, and were to such an extent subject to storage diseases that practically the entire crop was lost by the end of the storage period.

"From the time of maturity in the fall up to the end of January there is a consistent decrease in the ratio of fructose to glucose, and of fructose to total water-soluble carbohydrates under all conditions studied. From the standpoint of possible fructose manufacture, harvesting and utilization should take place near the time of maturity in November under Minnesota conditions. There is apparently a seasonal variation in the proportion of the water-soluble carbohydrates extractable. Girasole tubers at the time of harvest do not contain appreciable amounts of free reducing sugars."

On the nature of the carbohydrates found in the Jerusalem artichoke, A. C. THAYSEN, W. E. BAKER, and B. M. GREEN (*Biochem. Jour., 23 (1929), No. 3, pp. 444–455*).—The autumn-gathered tubers and the unripe pith of the Jerusalem-artichoke were found to contain "considerable proportions of an insoluble,

nonfermentable carbohydrate apparently identical with inulin." This substance was observed to disappear from the tubers almost completely toward spring, being replaced apparently by increasing proportions of more soluble compounds, especially dextrorotatory carbohydrates, of which a part at least was considered to be sucrose.

With respect to the inulin it was observed that although in itself the compound is not fermentable, mild autoclave treatment without acid hydrolysis was sufficient to render it fermentable. The earlier reported fermentability of inulin by yeast in the presence of other already fermenting carbohydrates was confirmed, though observed to an extent less than that formerly recorded

The isolation of a carbohydrate derivative from serum-proteins, C. Rimington (*Biochem. Jour., 23 (1929), No. 3, pp. 430–443*).—By using "very carefully purified proteins," and by means of a method of hydrolysis "which, whilst effective in breaking up the protein, had little or no action upon the carbohydrate substances formed," the author obtained from horse blood serum proteins a carbohydrate derivative which is taken to be a definite structural unit of these proteins.

"The substance isolated has the composition $C_{12}H_{23}O_{10}N$, is devoid of reducing properties, and exhibits in solution no measurable optical activity. The constituent sugars have been identified as glucosamine and mannose, and it has been shown that the compound has a molecular weight corresponding to that required by the simple disaccharide formula. Identical products are obtained from serum-albumin and globulin respectively and in a yield of approximately 2 per cent in each case. Calculation from the yield gives figures for the minimal molecular weights of the proteins which are in good agreement with values previously recorded in the literature."

The same product was obtained from the serum-proteins when trypsin was employed as the hydrolytic agent, "thereby establishing the distinction between this carbohydrate and the sulfur-containing tetrasaccharide of the glucoproteins."

A possible structure of the carbohydrate is suggested; and some chemical considerations, based on the presence of carbohydrate material in these two proteins, are discussed from the physiological and the immunological viewpoints.

The chemical constitution of the gums: Part 1.—The nature of gum arabic and the biochemical classification of the gums, A. G. Norman (*Biochem. Jour., 23 (1929), No. 3, pp. 524–535, fig. 1*).—It is shown by the author of this contribution from the Rothamsted Experimental Station that the acid group in gum arabic is of the uronic type. A method of isolation of the acid hydrolysis products is given, and the statement that the only sugars present in gum arabic are galactose and arabinose is confirmed, analytical figures being included for these substances.

"It is clear that gum arabic is not a substance of definite empirical formula. It is possible, however, to indicate its general composition—a nucleus-acid consisting of galactose and a uronic acid, probably galacturonic acid, to which is linked arabinose by glucosidic linkages. The arabinose is in consequence more easily split off than the other components. There seems to be no essential difference in structure between gums and hemicelluloses, both consisting of hexose and pentose sugars linked to uronic acids. It is suggested that it is by the protracted mild oxidation of linked hexose, and particularly galactose units, that pectin and the hemicelluloses and gums are formed."

Observations on the iodine-containing compounds of the thyroid gland.—Isolation of dl-3:5 diiodotyrosine, C. R. Harington and S. S. Randall

(*Biochem. Jour.*, 23 (1929), No. 3, pp. 373–383).—Continuing work of the senior author on thyroxine (E. S. R., 61, p. 201) and on its derivatives (E. S. R., 61, p. 202), the authors of the present contribution from the University College, London, describe a method for the isolation of thyroxine by boiling dried thyroid gland with a solution of barium hydroxide, bringing the filtered solution to pH 5.0 with sulfuric acid with the formation of a precipitate of barium sulfate and thyroxine, etc. The iodine of the filtrate from the last-named precipitation was found to be in the form of *dl*-3:5 diiodotyrosine. The compound was identified by analysis, the melting point of its mixture with a synthetic sample, etc.

A diagrammatic representation of the operations involved in the isolation of thyroxine and diiodotyrosine from desiccated thyroid gland accompanies the paper.

Note on anaerobiosis and the use of alkaline solutions of pyrogallol, H. NICOL (*Biochem. Jour.*, 23 (1929), No. 3, pp. 324–326).—The author notes that "it would seem desirable that the effect of small amounts of carbon monoxide upon the growth of microorganisms should be investigated," since it was found that carbon monoxide is evolved from even very weakly alkaline solutions of pyrogallol when such solutions are used for the absorption of oxygen from gases required for anaerobiosis.

A study of the utility of protein peptization by inorganic salt solutions as a means of predicting loaf volume, W. F. GEDDES and C. H. GOULDEN (*Cereal Chem.*, 7 (1930), No. 6, pp. 527–556, fig. 1).—Peptization determinations were made by the authors of this contribution from the University of Manitoba on more than 100 samples of experimentally milled straight grade flours. Gortner's 0.5 N magnesium sulfate method (E. S. R., 62, p. 801) and simplified procedures making use of 0.5 N solutions of potassium bromide and of potassium iodide were also applied. Baking tests were made on the same samples. A part of a considerable number of observations and conclusions are as follows:

"The mean total protein and peptized protein were quite uniform for the different grades, indicating no essential difference between peptizability of the flour proteins from sound wheat and immature and frost-damaged wheat. Baking results with the bromate formula, combined with progressively decreasing responses to the differential test, indicated inferior baking quality with decreasing grade.

"High negative correlations were obtained between total protein and percentage total protein peptized, which were not due to less complete extraction of the high protein flours. The response of an experimentally milled flour to bromate depends, in part, on the quantity of protein present and in part on other facts usually included in the term 'protein quality.' Correlations computed between percentage of the total protein peptized and loaf volume are not a satisfactory measure of the relative value of the peptized and nonpeptized fractions for baking purposes, since their magnitude is, in part, a reflection of the relation between total protein and loaf volume.

"Partial correlations involving the use of total protein as an invariate with peptized and nonpeptized protein as variables can not be utilized, because total protein contains both these fractions. A satisfactory comparison of the two protein fractions may be made by computing partial correlations, using peptized protein, nonpeptized protein, and loaf volume.

"The basic baking procedure revealed no significant difference in the relative value of the peptized and nonpeptized protein fractions for baking purposes, and also gave somewhat lower correlations between protein content of

flour and loaf volume than the malt and bromate methods. The peptization data with 0.5 N $MgSO_4$ showed the nonpeptized protein to be somewhat superior to peptized protein in its effect on loaf volume, while the results with 0.5 N KI revealed the peptized protein to be superior. The data for 0.5 N KBr were not significant."

Relation between crude protein content and loaf volumes obtained by two different methods of baking, R. H. HARRIS (*Cereal Chem., 7 (1930), No. 6, pp. 557–570, figs. 3*).—A series of 59 samples of Marquis wheat "were milled experimentally into a 75 per cent patent flour and the flour baked by the basic method. They were also baked by a formula including 1 per cent of malt and 0.001 per cent $KBrO_3$. In the case of an increase of volume greater than 10 per cent by the latter method, the samples were rebaked with 3 per cent malt and 0.5 per cent Arkady. Coefficients of correlation between baking strength and protein content obtained by the latter method were significantly higher, and appeared to justify the conclusion [of a previous investigator] that commercial use of the protein test is justified as a factor in the classification of hard red spring wheat."

The application of the iodimetric method to the estimation of small amounts of aldoses, M. MACLEOD and R. ROBISON (*Biochem. Jour., 23 (1929), No. 3, pp. 517–523*).—The conditions for the estimation of very small amounts of aldoses by the iodimetric method were investigated by the authors of this contribution from Lister Institute, London, and the conclusion drawn was that satisfactory results are obtained using from 3–4 times the theoretical quantity of iodine, with sodium carbonate as the alkali, and allowing the oxidation to proceed during 30 minutes at 21°. Specifically, "for routine estimations the conditions adopted were, for amounts of sugar equivalent to 1–1.5 mg. glucose, 3 cc. 0.02 N iodine; 0.2 cc. 5 per cent Na_2CO_3; 21° and 30 minutes." Under these conditions the oxidation of glucose was complete, while fructose and sucrose were oxidized only to a very small extent.

"Values obtained for other sugars and for hexosemono- and hexosediphosphates are also given. The extent to which fructose is oxidized by iodine in presence of excess of sodium hydroxide is much greater than can be explained by the Lobry de Bruyn and Van Ekenstein transformation, unless it is assumed that the change from ketose to aldose is largely increased owing to the rapid and continuous removal of the latter by oxidation."

Shelf to increase ashing capacity of laboratory electric furnace, R. HERTWIG (*Cereal Chem., 7 (1930), No. 6, p. 556, fig. 1*).—The author finds that the floor area available for flour ash determinations in the usual form of laboratory electric muffle can successfully be enlarged to nearly double the original capacity by supporting in the furnace at a suitable height a shelf of $\frac{3}{16}$-in. asbestos board provided with numerous $\frac{1}{4}$-in. perforations to permit free circulation of heat. "Four narrow strips of similar asbestos board fitted to the shelf edges with dove-tail joints serve as supports and firmly hold the shelf in position." A diagram accompanies the note.

The glass electrode and vacuum tube potentiometers, D. H. CAMERON (*Jour. Amer. Leather Chem. Assoc., 26 (1931), No. 1, pp. 7–23, figs. 6*).—The principles of the glass electrode are very briefly dealt with, three forms in which it may be made being illustrated. The use of the 3-element radio tube in the potentiometry of high-resistance circuits is somewhat more fully discussed, two potentiometric circuits involving 3-element tubes are illustrated, and the manipulation of such a set-up is outlined. The treatment is practical rather than mathematical.

METEOROLOGY

Weather dominated by solar changes, C. G. Abbot (*Smithsn. Misc. Collect., 85 (1931), No. 1, pp. 18, figs. 4*).—Evidence consisting of records of changes in the solar constant of radiation at the Astrophysical Observatory of the Smithsonian Institution at Montezuma, Chile, since 1924 and of temperatures at Washington, D. C., is presented to show that weather "is caused chiefly by the frequent interventions of actual changes of the emission of radiation within the sun itself." It "appears to be governed by variations in solar radiation. Long-continuing periodicities in solar variation are found which give promise of value for purposes of long-range weather forecasting. They appear to be submultiples of 11¼ and 33 years. All of these periodicities are found in Washington temperature departures."

The weather in Ohio during the year 1929, W. H. Alexander and C. A. Patton (*Ohio Sta. Bul. 470 (1931), pp. 258-269, figs. 3*).—Data for temperature and precipitation at the station at Wooster and in the State as a whole are summarized as in previous years. Frost-free periods at the station, 1894–1929, are also recorded.

It is stated that the record for the year shows that "freezing temperatures or lower occurred at one or more places in the State every month in the year except July and August, and even in these months the temperature dropped low enough for light frost." The average precipitation for the State (45.83 in.), though slightly deficient in certain months and places, was excessive, and the number of rainy days was somewhat above the average. "The snowfall exceeded the average by 2 in. or more. The killing frosts of the year, both in spring and fall, occurred rather irregularly over the State, most stations recording the last killing frost in the spring in April, but quite a number as late as May 20. While a few stations recorded the first killing frost in the autumn on September 19, most of them recorded the first on October 18 and quite a few as late as November 5. The number of clear days was above the average."

SOILS—FERTILIZERS

Is "pedology" soil science? C. F. Shaw (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 235-238*).—The author calls attention, in a note contributed from the University of California, to the fact that one referring to present dictionaries "would certainly conclude that 'pedology' referred to the work of child [παιδο-] specialists. There is ample evidence that by priority in use and in the exact root [πέδον] from which the word is derived, pedology should mean soil science, while 'paedology' could indicate child science. It is quite apparent," however, "that in the established usage of the English language pedology does not now indicate soil science." In view of this situation the possibility of the use of either of the words edaphology or kthonology as a specific term for soil science (ἔδαφος and χθονός [gen], both meaning ground or earth) is briefly discussed.

Grass and timber soils distribution in the Big Horn Mountains, T. J. Dunnewald (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 577-586, fig. 1*).—Rainfall and temperature, rock distribution, elevations, and soil reaction and organic matter are briefly considered in this contribution from the Wyoming Experiment Station.

Grass vegetation in the Big Horn Mountains region was found to result in dark colored, acid soils containing black colloidal organic matter in large

amount. When such land is "invaded by timber, the organic matter from the trees starts a leaching process which reduces the soluble organic and mineral content of the soil. Timber will invade either acid or basic soil, and its tendency is to increase the acidity of acid soil or to decrease the bases in a basic soil. Timber invasion removes iron, aluminum, and phosphorus less rapidly and calcium and magnesium more rapidly from a basic soil than from an acid soil. This process makes acid timber soils less fertile and less productive grazing land than the grass soils of the mountain areas. This difference in fertility is shown by the greater nitrogen content of the organic matter of the grass soils and by the greater amounts of available phosphates in them. The data seem to show that the bases are more actively removed by organic matter placed on top of the soil" than by that intimately mixed with it. Iron, aluminum, and phosphorus were removed less rapidly under these conditions from the basic soil and more rapidly from the acid soil.

Types of humus cover in the forests of New York (*New York Cornell Sta. Rpt. 1930, p. 25*).—Earthworm mull, "although not characteristic of any real forest region of the State, seems to be the predominant type in the woodlots of the Ontario Plain and along the Hudson River—probably, in general, in the agricultural regions in lower elevations. . . . . The characteristics of the typical earthworm mull are a granular structure resembling the food known as 'Grape-Nuts'; an intimate mixing of the humus with the mineral soil, from the soil surface down to a varying depth; a very loose and friable texture, resembling that of a well-worked garden soil; no coherent cover of humus or decaying leaves matted together by roots; no concentration of roots to the surface, or, if any, a very light concentration; a rich fauna including earthworms; and a rich herbaceous vegetation in which spring flowers, such as squirrel corn and dutchman's breeches, form a characteristic element."

Organic matter effects on soil, T. J. Dunnewald (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 713–718*).—The author of this contribution from the Wyoming Experiment Station finds, on the basis of the experiments here reported, that "organic matter partakes of the nature of the soil on which it is produced. The partial solution of this organic matter in water exerts varying effects on soil in dissolving and transporting materials dissolved from it. Sweet humus from basic soil is less soluble than acid humus from acid soil. Organic matter accumulates about three times as much under grass as under timber and is from two to three times as soluble in water where it accumulates in acid soil. There is more humus in the grass organic matter and its mineral content decreases with depth in the soil. Increased solubility of the organic matter with increased depth probably explains the podsolization of dark grass soil from the bottom toward the surface rather than from the surface downward. Persistence of lime in the humus of the acid prairie soil may explain the persistence of this organic matter under acid conditions as seen in the Corn Belt area of central United States."

The effect of organic matter upon several physical properties of soils, L. D. Baver (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 703–708, fig. 1*).—A study of the relation of organic matter to certain physical properties of soils, here reported as a contribution from the Ohio Experiment Station, led to the conclusion that "organic matter constitutes a large portion of the exchange complex of surface soils. The absorptive capacity for cations due to organic matter varied from 30 to 60 per cent. Oxidation of the organic matter produced a marked lowering of both the upper and lower plastic limits on the moisture scale. There was a slight tendency toward a decrease in the plasticity numbers. Oxidation of organic matter caused an increase in the percentage

of clay and a corresponding decrease in the percentage of sand and silt in the mechanical analyses of the soils studied. A definite correlation existed between the clay content and absorptive capacity of the oxidized soils."

Factors that influence nitrogen fixation in soils, T. F. Manns (*Delaware Sta. Bul. 167 (1930), pp. 44–52, figs. 5*).—In a critical study of the influence of fertilizers, lime, and manure on nitrogen fixation and the nitrogen status in the 4-year rotation of wheat, mixed hay, corn, and soybeans at the station farm on a Sassafras silt loam, after 20 years' duration, it is concluded that lime, notwithstanding its beneficial effect on the clover in the mixed hay crop, has not been a marked factor in nitrogen fixation or in nitrogen accumulation. "Leaving out the losses of nitrogen by seepage, of which we have made no study, the limed plats, unless accompanied by potassium, have apparently given less nitrogen gain (total in soil + total removed in crops) in the 20 years of rotation than have the unlimed plats." It is shown that "more nitrogen on the average has been removed by the crops on the limed plats than on the unlimed, but this nitrogen gain in the crop removal has possibly resulted from losses by more rapid oxidation of the organic nitrogen in the soil, for when we consider the nitrogen status in the surface soil (2,000,000 lbs. acre) we find there has been apparently greater removal from the limed plats than from the unlimed plats. . . . The balance is apparently in favor of the unlimed plats." It is noted, however, that "the irregularities in the soil may account for all or much of these so-called losses."

With respect to the effects of fertilizers, it was found that "in this 4-year rotation, potassium and phosphorus in combination have been the most active factors in stimulating nitrogen fixation. Potassium has probably been the most active single element. . . . Potassium is the only mineral element that the crops have removed in excess of that applied."

Methods of counting the number of legume bacteria in the soil, G. G. Pohlman (*Jour. Amer. Soc. Agron., 23 (1931), No. 1, pp. 70–77*).—The results secured in the work noted in this contribution from the Iowa State College "indicate that it is not possible to isolate and count the numbers of legume bacteria in soils by the use of nitrogen-free media, owing to the many other organisms which develop on such media. The use of dyes in media as an aid in the isolation and counting of the legume bacteria in soils did not give satisfactory results, but the data are insufficient to prove that they can not be used for this purpose. A more detailed study of their bacteriostatic action on soil organisms under varied conditions should be made before conclusions are drawn.

"The method of Wilson,[1] or some modification of it, appears to give an approximate count of the numbers of each species of legume bacteria in the soil, but this method requires too much time to be accepted generally.

"The results secured in the study of dye tolerance indicated that, although there was little difference in the organisms belonging to the same type within the species, there was a difference in the dye tolerance of the two types tested. This suggests the possibility of using dyes in media for separating various strains within species. However, more tests should be made before any one dye is recommended for use in this separation."

The nitrogen-fixing flora of the five-year rotation fertility plats, H. W. Batchelor and I. H. Curie (*Ohio Sta. Bul. 470 (1931), pp. 41–44, figs. 3*).—It is noted, with regard to the relation of fertilizer treatment on Azotobacter plats, that although either (1) nitrogen alone or with one other element or

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[1] Jour. Amer. Soc. Agron., 18 (1926), No. 10, pp. 911–919.

(2) phosphate or potassium alone "stimulates Azotobacter in pure culture, these plats do not support as great an Azotobacter population as the untreated checks." Further, the two manured plats did not support an Azotobacter population as high as that of the untreated plats. Azotobacter was found not to occur in the unlimed ends of the experimental plats.

In the case of *Clostridium butyricum*, on the other hand, the plats receiving fertilizer treatment had the greater population.

Combined-nitrogen fixing capacity in these soils was determined in individual samples both from the limed and from the unlimed ends of the plats of two sections in each of three successive years, with the result that "in general the fertilized plats have fixed more nitrogen than the unfertilized checks. . . . On the limed ends of these plats . . . there is an inverse relation between Azotobacter populations and nitrogen-fixing ability of the soil. On the unlimed ends there is a direct relation between Clostridium populations and nitrogen-fixing ability."

A study of the relation between the numbers of these organisms and the yields of crops showed that "although no definite relation between Clostridium populations and yields of oats, wheat, clover, and timothy on the check plats has been found, a direct empirical relation seems to exist between the Clostridium populations and the corn yields on these plats." A graph of the data obtained shows the definiteness of this relation.

[Delta soils at the Darien Branch Station] (*Georgia Coastal Plain Sta. Bul. 12 (1930), pp. 57, 58*).—The work undertaken comprised soil management, cover crop studies, lime requirement tests, and fertilizer tests. The soils low in organic matter showed themselves plastic, sticky, tight, capable of lumping badly when turned, and excessively hard when dry, "thus rendering the period very short during which this soil is in proper mechanical condition for handling." Austrian winter peas were thought best for a winter cover crop, cowpeas for summer cover. Note is made of lime tests, of which it is stated that "the work thus far does not indicate very definitely what the lime requirements are." Of the fertilizer work it is remarked that "due to irregularities in the soil it is believed that the results obtained thus far are not indicative of what may be expected from soils that have been properly leveled and brought into the desired mechanical condition"; but commercial fertilizers appeared to be needed.

[Fertility test, Mississippi Station], J. F. O'Kelly (*Mississippi Sta. Rpt. 1930, pp. 11, 12*).—With respect to the specific needs of soil types, it is stated that "potash has not been profitable on Houston soils. Medium quantities of potash pay well on soils of the Norfolk, Susquehanna, Ruston, and Oktibbeha types. Large quantities of potash respond well on the Ocklocknee soils. Nitrogen and phosphate are needed on all soils tested in about equal amounts." In a test of rates of application, "the heavier rates of application have consistently proven profitable. Nine hundred to 1,200 lbs. per acre seems most efficient. Heavier applications, however, have often returned higher profits." In tests of sources of plant-food elements "in a one year's test, very finely ground rock phosphate has compared favorably with superphosphate."

[Soil investigations, Ohio Station] (*Ohio Sta. Bul. 470 (1931), pp. 51-56, 232, fig. 1*).—This continues earlier work (E. S. R., 63, p. 15).

The chemical nature of soil acids, R. Bradfield and C. J. Schollenberger.—The colloidal fraction was separated from a number of clays and all exchangeable bases and soluble salts were removed by prolonged electrodialysis. The resulting hydrogen clays were analyzed and their acidity was measured by electrometric titration. Practically all of the calcium was found to have

been removed by the electrodialysis. In the most acid clays the sum of all the acid-forming constituents, all the carbon present being calculated as in the form of oxalic acid, all of the sulfur as sulfuric acid, phosphorus as phosphoric acid, nitrogen as nitric acid, etc., accounted for only about 10 per cent of the acidity found. "This seems to be conclusive proof that the great bulk of the acidity of clays is due to alumino-silicic acids. The acids have apparent dissociation constants ranging from 10^{-6}–10^{-7}. As the pure silicic acid prepared in the laboratory has dissociation constants of the order of 10^{-10}, it is felt that the soil acidity can not be attributed to silicic acid." The fact that the acidity observed was higher than that of the alumino-silicic acids synthetically prepared would seem to indicate a structural arrangement of the atoms that is quite different in the natural product from that of any synthetic alumino-silicic acids prepared thus far. The differences in physical properties between natural clays and synthetic imitations further supported this view.

Soil reaction required by different hay crops, E. E. Barnes.—This experiment having been started on soil of the reaction about pH 5.2, reactions of 4.5, 5.0, 6.0, 7.0, and 8.0 were secured by adding suitable quantities of aluminum sulfate to lower, and of limestone to raise, the pH value. It is considered that at the time of report any aluminum toxicity had had time to disappear or to be reduced to a great extent, and that the limestone additions had been in the soil long enough for the development of their full effect. The results obtained under the conditions thus defined "would indicate that a reaction above 5 pH is imperative for all the hay crops used in this test except soybeans, and that a reaction of pH 7 or at least more than pH 6 must be attained for both alfalfa and sweetclover. The yield of alsike clover at pH 6 is low as compared to both red clover and mammoth clover, but this of course may be a seasonal variation, which will not appear when an average of more yields is available."

The color of Ohio soils, G. W. Conrey and Oliver.—A study of the color of the soils of Ohio by means of an instrument blending measurable percentages of the colors of rapidly rotating disks of the four colors, black, white, yellow, and red, "has shown that, in those now mapped in the State, 32 distinct colors can be recognized. . . . A set of standard color samples covering this range has been prepared and their color value expressed mathematically by comparison with the standard color disks." Percentages of color components being stated in the order black, white, yellow, and red, the figures reported for samples of six soils are as follows: Bellefontaine silt loam 58, 10, 20, and 12 per cent; Miami silt loam 55, 12, 22, and 11; Russell silt loam 38, 16, 33, and 13; Cincinnati silt loam 39, 16, 31, and 14; Wooster silt loam 50, 14, 24, and 12; and Zanesville silt loam 32, 16, 34, and 18 per cent.

The dispersion of soils in mechanical analysis, Oliver.—As a result of the work on this subject it is concluded that there is obtained "a very incomplete dispersion of the clay fraction when the soil is treated with ammonium hydroxide in the way formerly employed in mechanical analysis. Sodium oxalate proved to be the most efficient dispersing reagent of any of those tried. It is evident that data secured with the use of ammonium hydroxide in dispersion may be considerably in error in representing the true clay of some soils. In order to compare these results with those of the hydrometer method devised by Bouyoucos [E. S. R., 57, p. 710], hydrometer readings were taken on the suspensions before the determinations by the pipette method were used. . . .

"An exmamination of the data shows that the material measured by the hydrometer method corresponds roughly with that finer than 0.01 mm. as

determined by the pipette method. The material in suspension at the end of one hour, suggested by Bouyoucos as representing the clay less than 0.005 mm., checks fairly closely with the results by the pipette method. The material in suspension at the end of the 2-hour period has been called clay less than 0.002 mm. The data here presented show that in all cases the percentage of clay less than 0.002 mm., as obtained by the pipette method, is smaller than the material in suspension at the end of 6 hours as determined by the hydrometer method. Evidently some other factor is involved in evaluating the clay less than 0.002 mm. as determined by the hydrometer method. Both methods show the greatest dispersion with sodium oxalate as a dispersing agent."

Soil management problems, M. A. Bachtell and H. R. Hoyt.—A study of the soil of the Pauling County Experiment Farm is reported, in which work it appeared that the physical condition of this soil presented the principal difficulty and that the growing of legumes was of more importance than fertilizer treatment.

[Soil and fertility tests in South Carolina] (*South Carolina Sta. Rpt. 1930, pp. 25, 27–34, 46–48, 129, 130, figs. 3*).—The following comprise the soil items reported by the station for the year:

Effect of lime on Norfolk sand, W. B. Rogers.—The growth of legumes was better on the limed areas. Larger amounts of fertilizer were often required for a successful crop on strongly acid soils than on soils which have a more favorable reaction. The results are tabulated.

Rate and time of applying sodium nitrate to crops, W. B. Rogers.—With respect to corn it is reported that "the application of all the nitrogen at knee-high led, whereas the application of three-fourths at knee-high and that of one-half at the same stage of growth followed in the order named." Results of a somewhat similar test on cotton fertilizer treatment are tabulated.

Placement of fertilizer experiments, R. W. Wallace.—It is noted that "every plat which had the fertilizer in direct contact with the seed, regardless of the rate of application, gave a lower percentage of germination. . . . [Further], the plats having the fertilizer applied at the sides of and on the same level with the seed gave a higher percentage of germination than did the plats having the fertilizer applied 2 in. below the seed. However, the germination on the plats where the fertilizer was applied at the sides of but 2 in. below the level of the seed, and in 3 bands 2 in. below the seed, were only 1 per cent lower than the side application of fertilizer. . . . From the 1929 results the fertilizer stirred with the soil two weeks before planting gave the highest yield of seed cotton per acre, which was 835 lbs. However, the plats where the fertilizer was applied and not stirred with the soil two weeks before planting produced 777 lbs. of seed cotton per acre. The plats having fertilizer applied in a 6-in. shovel furrow and stirred with a 4-in. shovel immediately before planting gave a yield of 748 lbs. of seed cotton per acre. Plats having fertilizer applied the same as the above-mentioned plats but not stirred with the soil gave a yield of 706 lbs. of seed cotton per acre."

Effect of the addition of arsenical compounds to soils, W. R. Paden and W. B. Albert.—The authors report Pee Dee Substation tests on soils in which crops had been treated with large quantities of calcium arsenate. The tests indicated that "there is a relationship between the unproductivity of certain soil types and the accumulation of soluble arsenic in the soil as a result of heavy applications of calcium arsenate." Lime improved the growth of cotton in the poisoned soils. Soils relatively low in iron "and other materials that would be expected to render arsenic insoluble" were found the most seriously injured by the arsenate.

Lime requirements of South Carolina soils, H. P. Cooper.—"Since a large percentage of South Carolina soils are too acid for optimum growth of certain important leguminous crops it will be necessary that lime be applied to many of the soils before they will be well suitable for a diversified cropping system." The percentages in 6 classes, from strongly alkaline to strongly acid, of soils of the Coastal Plain and Piedmont regions are presented.

A study of the relationship between the content of certain mineral elements of farm-grown roughages and the mineral content of the soil, J. H. Mitchell.—"Some positive results have been obtained. The protein and phosphorus content of the plant responded to fertilizer treatment more than the calcium."

A study of the influence of different factors on the iodine content of plants, J. H. Mitchell.—Potassium iodide, potassium iodate, and sodium nitrate have been applied as fertilizer sources of iodine. "The results at hand indicate that the iodine content of these plants can be increased by iodine fertilization. In some cases the increase has been as much as 100 per cent. Heavy applications of iodine carriers have sometimes produced a toxic effect upon plants in greenhouse experiments."

Soil improvement studies, C. S. Patrick.—It is considered that the rye and vetch cover crop has a good effect on following cotton, both cover crop and manure being better than the cover crop alone.

[Soil fertility work in Washington] (*Washington Col. Sta. Bul. 245 (1930), pp. 18, 19, 20*).—Former work (E. S. R., 63, p. 210) is continued.

The maintenance of organic matter in eastern Washington soils, S. C. Vandecaveye and H. F. Holtz.—It is reported that "yields from the plats where organic nitrogen has been applied in the form of alfalfa hay or barnyard manure have been less per unit of nitrogen supplied than those of the plats where equal amounts of nitrogen have been applied in the form of sodium nitrate or ammonium sulfate. Where straw alone has been applied at the rate of one and one-half tons per acre, yields have been less than those of the unfertilized check plats, while on all other plats yields have been greater than on the check plats. While greatest yields have been obtained from plats treated with inorganic nitrogen fertilizers, the most satisfactory nitrogen and soil organic matter maintenance has been obtained in the plats treated with organic nitrogen fertilizers and with the combination of ammonium sulfate and straw." It was observed also that "during certain stages of decomposition large quantities of atmospheric nitrogen may be fixed in a relatively short time by nonsymbiotic nitrogen-fixing bacteria."

Fertility investigations of Washington soils, H. F. Holtz and S. C. Vandecaveye.—This work included the placing of 70 sets of plats on 25 soil series west of the Cascade Mountains, and 30 sets of plats in irrigated and semihumid regions east of the mountains. In general, nitrogen and phosphorus gave the greatest increases in yield.

On hilltops in the eastern Washington wheat section, "3 rates of application, namely, 150, 250, and 350 lbs. of sodium nitrate, or its equivalent per acre, were used. During the season of 1929 the 150- and 250-lb. applications gave an increase of an average of 4.9 bu. of wheat per 100 lbs. of sodium nitrate; during the 1930 season all 3 rates gave an average of 5 bu. increase per 100 lbs. of sodium nitrate applied."

Plant composition as influenced by variations in soil types, H. F. Holtz and S. C. Vandecaveye.—"Results thus far show that a substantial increase in the mineral nutrient content of various crops may be procured on many soil series by the addition of commercial fertilizers."

Changes occurring in the irrigated soils as a result of irrigation, cropping, and of fertilizer treatments, S. C. Vandecaveye and H. F. Holtz.—In an orchard "where the various fertilizers have been applied for 4 consecutive years, there are definite indications that the pH of the soil is decreasing in all plats receiving nitrogen in the form of ammonium sulfate. The plats receiving phosphorus or potash in combination with nitrogen, or phosphorus and potash in combination with nitrogen in this same orchard yield more exchangeable calcium, magnesium, and potassium as determined by the electrodialysis and neutral salt solution methods."

The effect of various factors on inoculation and nitrogen fixation, S. C. Vandecaveye.—"The results seem to indicate that a satisfactory soil reaction, good drainage, the presence of lime, and an abundance of nodules on the roots are not the only requirements for successful growth of alfalfa on certain soil types."

[Soil fertility work of the Irrigation Branch Station], H. P. Singleton (*Washington Col. Sta. Bul. 245 (1930), pp. 59, 60*).—Fertilizer and rotation experiments in general showed increases in proportion to the amount of nitrogen applied. "Two tons of straw per acre, when applied with 130 lbs. of actual nitrogen did not greatly depress the yield under that of plats receiving nitrogen without straw."

The use of small amounts of lime in the row, M. M. McCool (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 530–536, figs. 2*).—The possibility of reducing the amount of lime necessary to produce alfalfa and sweetclover by localizing the lime in the soil near the seed was experimentally considered at the Michigan State College, limestone and hydrated lime in the row being compared with larger broadcast applications.

The results obtained from various soil types differed widely. In one instance, on 12 acres of an Isabella sandy loam, podsol group, 600 lbs. per acre of medium finely ground limestone was drilled into the ground with the seed with satisfactory results and an excellent crop of clover. Where 230 lbs. of hydrated lime was applied on 2 acres and where no applications of lime were made, the crop failed. The customary practice in this section is to apply broadcast 2½ to 3 tons of limestone per acre.

In another case the applications were made in triplicate, lengthwise of the field, making the strips approximately 57 rods long. "It would appear that the application of 552 lbs. of limestone in the row was as satisfactory for sweetclover and alfalfa as 3 tons of limestone" broadcast.

In conclusion it is noted that the author feels caution to be necessary in recommending lime in the row generally, "because not all soils respond to the same degree to this method. Upon further investigation it may be possible to throw several soil types into a group on which the use of small amounts of lime in the row with the legume seed will be successful."

Sulfur and phosphorus (*South Dakota Sta. Rpt. 1930, p. 7*).—According to this brief progress report rock phosphate was less available in sand cultures, in the year recorded, than were other forms of phosphate. The sulfur experiments mentioned included the use both of the element and of calcium sulfate.

AGRICULTURAL BOTANY

A comparative study of the stem epidermis of certain sugarcane varieties, E. Artschwager (*Jour. Agr. Research [U. S.], 41 (1930), No. 12, pp. 853–865, pl. 1, figs. 9*).—Observing marked differences in the anatomical structure of the stem epidermis of certain sugarcanes so marked that the author

believed they might serve in classifying varieties and types, a careful study was made of the epidermis of several varieties and seedlings. It was found that the epidermis could be satisfactorily removed by the use of potassium chlorate and nitric acid, and its structures shown by staining with chloroiodide of zinc.

The epidermis was found to consist of long and short type cells, the latter commonly occurring in pairs with one member a cork cell and the other a silica cell. The cork cell was reniform, rectangular, trapezoidal, or elongated like a hair. The silica cell was biscuit shaped, varied but little in size and form, and was sometimes entirely absent. Elongated hairlike cork cells were abundant in certain varieties, scarce in others, and entirely absent in certain cases. Stomata differed in number with the varieties and were always irregularly distributed.

The author concludes that the structural composition of the epidermis should be useful in identification.

GENETICS

Chromosome behavior and pollen production in the potato, A. E. Longley and C. F. Clark (*Jour. Agr. Research [U. S.], 41 (1930), No. 12, pp. 867–888, pls. 2, figs. 7*).—The number and meiotic behavior of chromosomes in tuber-bearing forms of *Solanum* were studied by the U. S. D. A. Bureau of Plant Industry. Cytological material was collected from 2 unnamed seedlings and 38 commercial varieties belonging to *S. tuberosum* and from 11 wild forms referred to 10 distinct species.

The 10 wild species of potato were found to have 12, 18, 24, or 36 as their haploid chromosome number. *S. commersonii* and *S. cardiophyllum* f. *coyoacanum*, with 18 as their haploid chromosome number, had meiotic irregularities in their pollen mother cells similar to those found in a known F_1 hybrid of *S. fendleri* × *S. chacoense*, suggesting that these two wild species are natural hybrids.

Of the cultivated varieties of *S. tuberosum* there were three grown in South America with 12 as their haploid chromosome number, and 37 grown in the United States with 24 as their haploid chromosome number. The meiotic behavior of the 24-chromosome *S. tuberosum* was found to vary from regular in a few sorts to extremely irregular in many of the varieties. An appreciable amount of pollen was produced by only the few varieties with a regular chromosome behavior, whereas varieties with an irregular chromosome behavior produced practically no pollen. It appeared that unfruitfulness in potatoes may be due to abnormal chromosome behavior at the time of pollen formation. In a few selected individuals chromosome behavior seemed to be affected to some degree by environmental changes. The number and behavior of their chromosomes suggested that our cultivated potato varieties have a mixed ancestry, and that the ancestors are to be found not in a single wild species but in two or more.

Inheritance studies in Phaseolus vulgaris, T. M. Currence (*Minnesota Sta. Tech. Bul. 68 (1930), pp. 28, figs. 9*).—The mode of inheritance of three characters (1) lignified tissues in the sutures and side walls, (2) the shape of the pod in cross section, and (3) the color of the pod as related to localized chlorophyll development, was studied in certain bean crosses carried to the F_3 generation. In the case of the lignified tissues which determined the presence or absence of stringlessness, inheritance in the Wardwell (stringless) × Longfellow (stringy) and Pencil Pod (stringless) × Robust (stringy) crosses seemed to be controlled by a single Mendelian factor, but in a third cross,

Refugee Wax (stringless) × Tennessee Green Pod (stringy) a two factor hypothesis was necessary for satisfactory explanation. The author deemed it likely that one dominant factor produced stringlessness but may have been inhibited in action by the second factor. Observations on a number of additional crosses indicated the existence of two genetic types of stringless and possibly two types of stringy characters in the several varieties studied.

A study of the progeny of a cross between Wardwell and Longfellow indicated that pod width is inherited as a quantitative character and may be associated with a series of multiple factors. Pod width was found to be associated with the fiber of the side walls, and it is deemed possible that the two characters are dependent on the same factor or factors or possibly on different factors closely linked in the same chromosome.

The inheritance of pod color in Crystal White Wax was found to give monohybrid results when crossed with green, but when crossed with a yellow podded variety the results indicated dihybrid inheritance. The color regions for the several types of pods are described with reference to the anatomical structure of the pods.

The inheritance of a lethal muscle contracture in the sheep, J. A. F. Roberts (*Jour. Genetics, 21 (1929), No. 1, pp. 57–69, pl. 1*).—A lethal deformity in newborn lambs characterized by rigidly fixed joints and the replacement of certain flexor muscles by fibrous tissues is described from anatomical studies by W. C. Miller.

That the conditions depend upon a simple recessive factor was shown by the production of 24 normal and 9 deformed offspring by matings of rams and ewes which had previously produced deformed young (matings of heterozygotes), and 29 normal and 4 deformed young produced by matings of a heterozygous ram with 19 ewes sired by a heterozygous ram. Though there was some indication of an abnormal sex ratio in a few years, data in other years did not bear out the lack of equality of sexes.

A study of the results of intensively inbreeding Berkshire swine, E. G. Godbey (*South Carolina Sta. Rpt. 1930, p. 35*).—A total of 551 pigs have been produced in an inbreeding experiment. The coefficient of inbreeding has varied from 1.56 to 56.83 per cent. There was no correlation between the initial weight of the pigs and the degree of inbreeding, but the final weight of the pigs and the degree of inbreeding showed a correlation of -0.6 ± 0.035.

Breeding dairy cattle, J. P. LaMaster and E. C. Elting (*South Carolina Sta. Rpt. 1930, pp. 51, 52*).—After 10 years' study of different methods of breeding dairy cattle, comparison of dams' and daughters' records indicated that 6 dam and daughter comparisons were as accurate a measure of the sires' transmitting ability as 10 such pairs.

The mode of inheritance of yearly butterfat production, W. Gifford (*Missouri Sta. Research Bul. 144 (1930), pp. 62, figs. 6*).—A study was made of the fat records of the daughters of Holstein-Friesian sires having ten or more daughters in the Advanced Register. The dams' records were also considered in connection with the daughters' records. The daughters' records of cows having four or more daughters in the Advanced Register were also tabulated. Suitable corrections were made in the records for age and length of test.

It was found that the production records of dams and daughters showed a correlation of 0.322 ± 0.013, but because of the influence of the sires of different capacity for production this correlation was reduced to about 0.197 when the correlation was made by groups of sires showing different capacity for production. In these groups the value of b in the linear regression of daughters' production on dams' production was about 0.2.

A method of measuring the sires' potential transmitting ability as the average of the daughters' production minus 0.2 of the average of their dams' production is suggested. Twenty-three sires were compared by five different methods of measuring transmitting ability, and it was concluded that while the method here developed showed slightly the best results, there was no practical advantage for any of the five methods over the average production of the sires' daughters. Linear regressions for the sires' sons' daughters' yearly fat production were developed as follows: 542+0.191 times dams' yearly fat production; and 573+0.18 times sires' daughters' fat production.

Variation in activity and production of spermatozoa by White Leghorn males, R. PENQUITE, W. A. CRAFT, and R. B. THOMPSON (*Poultry Sci., 9 (1930), No. 4, pp. 247–256, figs. 2*).—From a study at the Oklahoma Experiment Station of 140 samples of semen collected from hens mated with 21 White Leghorn males in 1925, 1926, and 1927, there was found to be a wide range in the number of spermatozoa and the percentage of sperm which were motile. The second year's samples showed the largest number of sperm and the greatest percentage of live sperm. The less active males produced a slightly lower percentage of live sperm and a smaller number per cubic millimeter. As matings occurred in rapid succession, the number of sperm produced was lowered.

It appeared to require 2 or more days after mating before fertile eggs were laid, and fertile eggs were not laid for more than 14 days after mating. To insure high fertility females must mate every 2 or 3 days.

The effect of disturbances upon the rhythm of egg production, D. C. WARREN (*Poultry Sci., 9 (1930), No. 3, pp. 184–193, fig. 1*).—A comparison was made at the Kansas Experiment Station of the interval between eggs and clutch size in hens caught and released and hens caught and transferred to other quarters. Careful records were available before handling on 57 birds that were caught and 61 birds that were caught and moved to other quarters.

It was estimated that the interval before laying the next egg after disturbance in the birds that were moved was extended 6.9 hours for those laying on the day on which the disturbance occurred, and 12.8 hours for those failing to lay on that day. In the birds that were not moved the handling increased the interval 4.1 hours for those not laying on the day of the disturbance, while those laying on the day of disturbance produced the next egg at the expected time. It is suggested that the egg in the oviduct is more subject to the retarding effect of a disturbance than the egg not yet released from the ovary.

The average interval between eggs laid in the 15-day periods before and after disturbance showed that moving increased the interval 7.3 hours, but that handling alone had no influence.

Moving the birds lowered the production during the subsequent 15 days, and 18 birds stopped laying for 12 days, but the influence of catching alone on egg production was insignificant.

Studies in embryonic mortality in the fowl.—IV, Comparative mortality rates in eggs laid at different periods of the day and their bearing on theories of the origin of monsters, F. B. HUTT and A. M. PILKEY (*Poultry Sci., 9 (1930), No. 3, pp. 194–203, fig. 1*).—In continuing this series (E. S. R., 63, p. 522), a study was made of the influence of the time of laying on the fertility and hatchability of eggs laid by the station flocks at Crookston and University Farm, Minn.

The results indicated that fertility was independent of the time of laying, but that eggs laid before 9 o'clock a. m. showed the lowest embryonic mortality. There was a difference of 4.69±0.88 per cent in the embryonic mortality of

eggs laid before 9 o'clock and those laid between 12 and 2 o'clock. The differences were greater than five times the probable error in favor of the eggs laid in the morning over those laid in the afternoon. It was also found that as the season advanced from March to May the difference decreased between the mortality of eggs laid early and those laid late in the day. These findings suggest that eggs laid early in the morning include a considerable percentage of eggs which have been held over in the oviduct sufficiently long so that development has advanced beyond the stage more likely to be unfavorably influenced by cold.

The dead embryos were examined for the presence of teratological abnormalities, and it was found that abnormalities were less common in eggs laid before 9 o'clock. The percentage of such abnormalities increased in eggs laid later in the day.

Studies in hatchability.—IV, The effect of intercrossing inbred strains of chickens on fertility and hatchability, M. A. JULL (*Poultry Sci., 9 (1930), No. 3, pp. 149–156*).—Continuing this series (E. S. R., 62, p. 552), data are reported on the fertility and hatchability of four inbred strains of Barred Plymouth Rocks and four inbred strains of White Leghorns in 1928, and the intercrosses between these strains in 1929, together with comparative data for noninbred pens of both breeds.

The results showed consistently that the fertility of the intercrossed inbred strains of both breeds was less—19.74±4.46 per cent in Barred Plymouth Rocks and 14.56±2.03 per cent in White Leghorns—than in the inbred matings. Selective mating or selective fertilization of the eggs is suggested as a possible explanation for these differences.

Hatchability was uniformly greater in the intercrossed than in the inbred matings, the differences in Barred Plymouth Rocks and White Leghorns being, respectively, 20.65±3.61 and 11.71±2.75 per cent.

A note on the effects of different doses of thyroid on the fowl, F. B. HUTT (*Jour. Expt. Biol., 7 (1930), No. 1, pp. 1–6, figs. 2*).—Nine-months-old Minorca cockerels and pullets were given daily doses of 4 mg. of thyroid iodine in the form of desiccated thyroid for from 1,000 to 10,000 gm. of body weight. The larger doses of 4 mg. per 1,000 to 2,000 gm. live weight caused the death of both males and females. Doses up to 4 mg. per 5,000 gm. live weight caused loss of weight. New feathers growing on the cockerels were "henny" in character. Depigmentation was also marked in case of the heavier doses, but there was an increased melanin production with lighter doses. The use of a definite dosage of thyroid iodine tended to give consistent results and explained the discrepancies in the results of other workers.

FIELD CROPS

[Agronomic work in Delaware], G. L. SCHUSTER, C. E. PHILLIPS, and H. C. HARRIS (*Delaware Sta. Bul. 167 (1930), pp. 11–16, fig. 1*).—Continued experiments with field crops (E. S. R., 62, p. 728) reported on included variety tests with alfalfa; fertilizer trials with corn, sweetpotatoes, and alfalfa; and acidity studies with wheat, soybeans, and crimson clover.

[Field crops work at the Georgia Coastal Plain Station, 1929], S. H. STARR (*Georgia Coastal Plain Sta. Bul. 12 (1930), pp. 8–17, 18–33, 39–42, 52–55*).—Continued agronomic experiments reported on as heretofore (E. S. R., 62, p. 728), embraced variety tests with oats, wheat, rye, cotton, corn, peanuts, soybeans, winter field peas, vetch, sweetpotatoes, and tobacco; fertilizer trials with oats, corn, cotton, soybeans, sweetpotatoes, potatoes, and tobacco; green

manuring and liming tests with oats, corn, and cotton; cultural (including planting and harvesting) tests with oats, wheat, winter field peas, vetch, sweetpotatoes, and potatoes; crop rotations for tobacco; steam sterilization of tobacco beds; and a study of color inheritance in sweetpotatoes.

[Agronomic work in Mississippi, 1930], J. F. O'Kelly, C. F. Briscoe, J. C. C. Price, C. F. Ames, H. F. Wallace, and W. R. Perkins (*Mississippi Sta. Rpt. 1930, pp. 9–11, 14, 28, 37, 38, 40, 41, 42–44, 48*).—Further experiments with field crops at the station and substations (E. S. R., 64, p. 432) comprised breeding work with corn, cotton, and soybeans; variety trials with cotton, corn, winter legumes, and sweetpotatoes; cultural (including planting) tests with cotton and sweetpotatoes; fertilizer trials with cotton and potatoes; and inoculation studies and cutting tests with soybeans.

[Field crops and plant breeding investigations in New York] (*New York Cornell Sta. Rpt. 1930, pp. 54–57, 58, 59, 99, 100, 102, 103*).—The progress of breeding work with corn, field beans, wheat, oats, barley, cabbage, potatoes, and roses is summarized, and brief accounts are given of results obtained in potato experiments concerned with ecological factors affecting yield and quality, adaptation to muck soil, green sprouting (E. S. R., 64, p. 220), fertilizers, and storage (E. S. R., 64, p. 222).

In genetic studies the deciduous awn characterizing a Chinese variety of oats was recessive in the ratio of 3 normal to 1 deciduous in one cross and 15:1 in another. The character velvet node in Ruakura oats followed a 3:1 ratio in Ruakura×Upright. In crosses between Marquis and a liguleless wheat and Japan bearded and the liguleless type segregation was in the ratio of 15 plants with ligules to 1 liguleless. Attempts to obtain hybrids between rye and species of wheat with 14 and 28 (2*n*) chromosomes resulted negatively, although thus far rye has been crossed successfully with varieties of *Triticum vulgare*.

Fertilizer trials with potatoes in several localities in cooperation with the U. S. Department of Agriculture showed concentrated fertilizers to produce about the same yields as standard mixtures when the same quantities of nutrients were applied. No injury was observed from the concentrated fertilizer applied by hand in the marked row as a surface application ahead of the planter. The 4–8–8 fertilizer, the standard mixture used, gave profitable increases in yield up to 900 to 1,200 lbs. to the acre, indicating that most potato growers could afford to increase the quantity of nutrients used for potatoes.

[Field crops experiments in Ohio] (*Ohio Sta. Bul. 470 (1931), pp. 21–41, 44–51, 125–127, 225, 226, 228–230, 231, 232–236, figs. 3*).—Comparisons of methods of fertilizing corn in the hill, by R. M. Salter, E. E. Barnes, and C. L. Thrash, showed that under the conditions placing the fertilizer in bands 2 or 3 in. wide, spaced to give a lateral separation of at least 3 in., and at a horizontal position about 0.75 in. above the seed may be expected to give most satisfactory results.

A study of the physiology of corn by V. H. Morris showed that under normal environmental conditions a considerable amount of sugars accumulates in the stem and persists during grain formation, the excess of sugars manufactured at this time being stored in the grain as starch. Where barrenness is induced artificially or caused by environmental conditions there is an accumulation of even greater quantities of sugars in the stems, which may amount to from 3 to 5 per cent entirely in the form of sucrose or cane sugar. On the other hand, the removal of any of the leaves of the corn plant results in reduced sugar content, with subsequent reduction in yield of grain. Ranked as to the percentages of bound water, i. e., water held by the colloidal material of the leaves, corn varieties were observed by J. D. Sayre to be in order quite similar to their ability to withstand drought.

Seeding rates and dates indicated from tests over more or less prolonged periods by H. L. Borst and L. E. Thatcher for oats 11 pk. and early planting and for wheat 8 pk. and September 22 to 25. Little evidence was obtained to show that the seeding rates should vary with the dates in a normal season. Early plowing, August 1 to 15, without further preparation of the seed bed until planting led methods of preparing oats stubble for wheat. Wheat furrow drilled outyielded that planted with the ordinary drill when sown at the usual seeding date, early in October. With sodium nitrate applied by Salter as a top-dressing for wheat, highest returns came from April 15 applications. Seeding wheat and applying complete fertilizer in one operation by J. T. McClure resulted in higher grain yield than applying fertilizer just before planting. Half applications of high-analysis (4–24–4) fertilizer produced wheat yields approximating those from the full application of low-analysis (2–12–2) fertilizer.

Oats planted by Thatcher on disked corn stubble yielded only slightly more than on spring plowing and were weedier. Planted with a disk grain drill without other preparation oats yielded 9 bu. less than on disking. Oats broadcast on plowed land and covered with a harrow yielded about as much grain as that drilled on plowed land. For early dates of seeding disking equaled or surpassed plowing, although it was indicated that for late seeding plowing may be better on the soil.

Hay curing experiments at Columbus by C. J. Willard indicated that after the dew has dried from alfalfa, soybeans, red clover, sweetclover, and alsike clover the decrease in moisture content for the rest of the day, if the soil contains enough moisture so that the plants do not actually wilt, is practically never over 3 per cent and usually much less. Since only a comparatively short time is required for green cut forage to lose 3 per cent of moisture, there is no advantage in waiting until afternoon to cut forage so far as the moisture content of the green forage is concerned. However, the forage cut with the dew off dried more uniformly. The amount of water present as dew at 7 a. m. amounted to over one-fourth of the green weight of the forage in some exceptionally heavy dews. Soybeans cut in August and the first week of September, when reasonably good curing weather prevailed, cured as rapidly and more uniformly in side delivery windrows raked after wilting and turned occasionally as when left in the swath to complete curing. Raking the cut plants at once usually resulted in slower curing but produced an excellent quality of hay.

Further studies (E. S. R., 57, p. 733) indicated a loss of 410 lbs. of air-dry material in the roots of sweetclover from early November until about April 1. This loss in dry weight evidently was in stored materials used by the plant in respiration during winter.

Although cutting during the year sown has been unfavorable to sweetclover (E. S. R., 57, p. 632), clipping red clover August 15 to September 1 has resulted in higher hay yields the next year than with no clipping. Cutting from October 15 to November was always decidedly injurious. Alfalfa was not injured by clipping from August 15 to September 1, but evidently this was not followed by a yield increase the next year.

Compared with the averages for 11 years previous in rotations, the yields recorded by Thatcher during the dry year 1930 were decidedly less from red clover and timothy and in several cases much greater from sweetclover and alfalfa. A remarkable production of alfalfa roots compared with top growth was also observed by Willard during the summer of 1930, indicating that alfalfa would enter the 1930–31 winter in better condition to withstand win-

terkilling and to give larger hay yields the next year than had been the case for at least 8 years. The observation that areas cut four times stored large amounts of reserves and retained their vigor of recovery much better than they did in normal seasons suggested that climatic differences are directly responsible for the fact that frequent and premature cuttings are not so injurious in the Western States as they are in the humid sections.

When soybeans were used as a nurse crop by Thatcher, alfalfa produced better stands than sweetclover or a clover-timothy mixture, whereas hairy vetch failed entirely except in a very thin stand of soybeans. Sowing a liberal quantity of grass seed at the time of drilling the soybeans is advised. The soybeans should be drilled solid, early, at least by the second or third week in May, using not more than 6 pk., and should be cut for hay in August, permitting the clovers to make enough fall growth to winter successfully. Pure cultures of bacteria, isolated by H. W. Batchelor and I. H. Curie cooperating with the U. S. Department of Agriculture, from any of six varieties of soybeans gave satisfactory inoculation in all varieties of soybeans tested. The inoculating efficiency of seven commercial soybean cultures was also compared.

Side dressing sugar beets at the Northwestern Substation by J. S. Cutler and J. B. McLaughlin with materials carrying 15.5 lbs. of nitrogen per acre resulted in an average acre gain of 2 tons of beets worth $15. This increase was accompanied by better stands and higher sugar content and purity. Row applications of complete fertilizer during the dry season of 1930 increased yield and sugar contents over untreated beets.

In a 2-year rotation of soybeans (plowed down) and potatoes where various quantities of lime were applied, J. Bushnell observed that potato yields were higher on moderately limed plats, partly due to the larger growth of soybeans on these plats and the consequent larger quantity of organic matter plowed under. Benefits were shown by Irish Cobblers in southern Ohio from nitrogen up to 9 per cent in a complete fertilizer. On Russet Rural planted in May at Wooster only small quantities of nitrogen were needed, while at Strongsville nearer Lake Erie a larger proportion was required. The use of a high proportion of nitrogen at Wooster gave a vigorous growth of tops, but depressed the yield below the no-nitrogen plat.

Other experiments with field crops (E. S. R., 63, p. 29) included variety tests with oats, wheat, corn, and potatoes; breeding work with oats and wheat by Borst and G. H. Stringfield; and trials of methods of reseeding small grain stubble by Cutler. Agronomic activities at the county and regional experiment farms embraced fertility tests with corn, wheat, and clover by M. A. Bachtell; pasture studies with Sudan grass by W. E. Weaver; comparison of oats and wheat as crops by Bachtell and P. A. Jones; comparison of timothy with alfalfa by Bachtell and H. Allen; observation of the effect of late spring frost on corn by S. C. Hartman and Cutler; fertilizer trials with oats by Bachtell and L. A. Malik; topping, suckering, and harvesting tests with tobacco by H. M. Wachter; and cultural and fertilizer tests with buckwheat by Hartman and Bachtell.

[Field crops experiments in South Carolina], H. P. Cooper, W. B. Rogers, E. C. Elting, J. P. LaMaster, J. H. Mitchell, A. M. Musser, E. D. Kyzer, R. E. Currin and C. S. Patrick (*South Carolina Sta. Rpt. 1930, pp. 23, 24, 25–27, 48–51, 83, 84, 93, 94, 95–99, 115, 116, 117–121, 122–124, 129, figs. 5*).—Further agronomic work (E. S. R., 62, p. 625) at the station and substations comprised variety tests with barley, corn, oats, wheat, rye, peanuts, potatoes, sweetpotatoes, tobacco, soybeans, crotalaria, and lespedeza; fertilizer trials with corn, oats, potatoes, sweetpotatoes, tobacco, and pasture; cultural (including planting) tests with sweetpotatoes, alfalfa, peanuts, and pasture; breeding

work with corn; and fertilized rotations for tobacco. Fertilizer formulas are recommended for bright flue-cured and dark tobacco and for plant beds.

Further applications of fertilizer were made on the established pasture sod. None of the various combinations of fertilizer appreciably affected the composition of the grass in 1929. The grass from plats cut weekly was somewhat lower in dry matter and crude fiber and considerably higher in nitrogen than from plats cut at 2-week intervals. The plats cut at 3-week intervals yielded slightly more dry matter and the percentage of nitrogen was not affected. At the beginning of the 1930 season limed plats contained a much higher percentage of clovers and less weed infestation than the unlimed series. The green material from the limed exceeded that from the unlimed series by about 14 per cent. The stimulating effect of the various fertilizer treatments followed closely the trend in 1929 except that the rate of growth had been less because of limited rainfall.

Indications were at the Coast Substation that from two to three moderate applications of readily available nitrogen during the growing season will increase profitably the carrying capacity of ordinary carpet grass pasture. The best stand of carpet grass and lespedeza mixture was had on land burned, plowed and disked, and harrowed, and the lespedeza responded in growth to applications of superphosphate.

In potato fertilizer experiments in progress for 8 years best results at the station on sandy river bottom soil came from 1 ton per acre of 5–7–5 fertilizer carrying ammonia 5 per cent, phosphoric acid 7, and potash 5 plus sodium nitrate 100 lbs.; at the Pee Dee Substation on fertile Orangeburg sandy loam from 1 ton of 5–7–5 mixture; and at the Coast Substation from 1.5 tons of 5–7–5. One source of potassium seemed as good as another at the station, although omission of the element reduced yields about 10 bbls. per acre.

[Agronomic studies in South Dakota] (*South Dakota Sta. Rpt. 1930, pp. 5, 6, 7–11*).—The progress of breeding work with corn (E. S. R., 63, p. 439) and oats, cultural tests with flax, trials of cereal varieties for combining, tests of potato seed stocks, and studies of carbohydrate variations in corn (E. S. R., 63, p. 31) are noted briefly.

[Crop yields on the Vivian, S. Dak., Experiment Demonstration Farm], A. N. Hume (*South Dakota Sta. Bul. 253 (1930), pp. 5–20, figs. 6*).—During the period 1919–1928 Rainbow flint corn averaged 6,130 lbs. of silage per acre and Vivian 13, a dent, 5,163 lbs. Listed corn made 6,522 lbs. of silage per acre, drilled corn 5,884 lbs., and checked corn 6,160 lbs. The average acre yield of silage corn from manured land was 5,221 lbs. and from unmanured land 6,072 lbs. Based on pounds per acre or farm values, Odessa barley has been more productive than either Cole oats or winter rye. Alfalfa produced higher hay yields when sown in Cole oats than in barley, which in turn was superior to winter rye as a nurse crop.

Dairy cattle appeared to prefer native grass pasture, white sweetclover, and yellow sweetclover in order. The yellow sweetclover was observed to continue growth and remain green longer and more persistently during periods of comparative drought than either white sweetclover or native grass and even longer than alfalfa.

[Field crops experiments in Washington], E. G. Schafer, A. L. Hafenrichter, O. E. Barbee, J. R. Neller, C. L. Vincent, H. M. Wanser, H. P. Singleton, and L. L. Claypool (*Washington Col. Sta. Bul. 245 (1930), pp. 14–16, 17, 24, 25, 46, 54–56, 57, 58, 62*).—Activities with field crops (E. S. R., 63, p. 224) continued at the station and substations included varietal trials with winter and spring wheat and barley, oats, rye, corn, flax, potatoes, and alfalfa; cultural

(including planting) tests with wheat and potatoes; fertilizer tests with potatoes; breeding work with wheat, oats, and potatoes; crop rotations; pasture tests; and bindweed control studies.

After summer fallow, varieties of winter wheat averaged 10 bu. more than spring wheat varieties, whereas following peas the spring wheats led by 2.8 bu. No advantages were apparent at the Adams Substation from seeding under favorable seed bed conditions with the deep furrow drill, although it aided in the control of soil drifting. More competition was evident at the station between winter grains grown with sweetclover and alfalfa than between these forage crops and spring grain, grasses, or peas.

The McCormick, Keeper, Early Norther, and Jersey Red Skin potatoes showed resistance to mosaic diseases at the station, and seedlings with one of these as a parent did not become affected with mosaic when field grown under diseased conditions for from 1 to 5 years. A study of seedling crosses showed that the red color of the tuber was not dominant, probably due to multiple factors or other cause. The vine characteristics of seedlings having McCormick as one parent resembled McCormick in most cases. In F_1 seedlings having Irish Cobbler as one parent the roundish form of Irish Cobbler was dominant over other shapes.

Cultural work at the Irrigation Substation showed that for highest total yields and the most U. S. No. 1 potatoes the soil must be kept continually moist. With 1 plant per hill, spacing hills from 6 to 12 in. apart gave better yields and quality than 18- to 24-in. spacing. In hills 1 ft. apart, 2 and 3 plants per hill gave more No. 1 potatoes than 1 or 4 plants per hill. Plats receiving nitrogen outyielded other plats, no response coming from phosphorus or potassium. Yields were correlated closely with height of plants.

[Forage crops experiments in western Washington], M. S. Grunder (*Western Washington Sta. Bul. 18-W (1930), pp. 5–9*).—The principal observations in variety tests of grasses and silage crops, pasture studies, and production trials with alfalfa and sweetclover are summarized. Italian ryegrass, orchard grass, and Kentucky bluegrass led the grass varieties in acre yield of dry matter. Rotation grazing, where from 12 to 15 dairy cows pastured a one-acre field for short periods, produced a much better quality of pasture than with a single large pasture. On two upland pasture areas receiving lime and superphosphate and manure and superphosphate furnished averages of slightly over 200 grazing days per acre compared with 161 from the check. Orchard grass, Italian ryegrass, velvet grass, and white and alsike clovers made satisfactory growth on cleared gravelly woodland where considerable volunteer tall meadow oatgrass was thriving. On upland clay loam sunflowers produced about twice as much tonnage of silage per acre as the next best crop.

Small grain production in the Coastal Plain of Georgia, W. J. Davis (*Georgia Coastal Plain Sta. Bul. 15 (1930), pp. 11*).—The principal observations in variety tests with wheat, rye, oats, and barley, seeding trials with oats and wheat, and fertilizer, liming, and green manure tests with oats, in cooperation with the Georgia College of Agriculture and the U. S. Department of Agriculture, summarized for the period 1920–1929, have been noted from another source (E. S. R., 62, p. 728).

Corn production in the Coastal Plain of Georgia, W. J. Davis (*Georgia Coastal Plain Sta. Bul. 14 (1930), pp. 15, fig. 1*).—Experiments with corn, dealing with varieties, fertilizers, liming, and green manures, are summarized for the period 1920 to 1929, and climatic conditions, soils, and cultural practices are described briefly. The results of the work showing that corn may be grown profitably on most of the soils of the Coastal Plain through the use of the best

varieties on good lands, the fertility of which is being maintained by green manuring and the judicious use of commercial fertilizers, have been noted extensively (E. S. R., 58, p. 732; 62, p. 729).

Cotton production in the Coastal Plain of Georgia, W. J. Davis (*Georgia Coastal Plain Sta. Bul. 13 (1930), pp. 29, figs. 2*).—The information given on the climatic and soil conditions, cultural and field practices, varieties, fertilizers and green manures for growing cotton in the Coastal Plain section of Georgia, and for the control of boll weevil is based largely on experiments already noted in detail (E. S. R., 62, pp. 728, 757).

[Cotton research in South Carolina] (*South Carolina Sta. Rpt. 1930, pp. 39–42, 43–45, 102, 103–113, 128, figs. 6*).—Experiments with cotton (E. S. R., 62, p. 629) included variety (E. S. R., 62, p. 830), cultural, fertilizer, and cover crop tests; physiological and fiber studies; and seed treatments.

Studying factors which influence the growth and development of cotton buds and bolls, G. M. Armstrong and W. B. Albert determined that bolls of the first position on the branch, up to the age of 8 days, were higher in percentage of sugars, dextrins, and starches than comparable third position bolls of the same age. The contrasts were greatest between bolls 2 and 4 days old. The developing seed and lint of bolls at various ages was appreciably higher in percentage of sugars and starches than the boll walls or the pedicels and bracts except when the bolls were nearly mature, the highest percentages of sugars and starches being present when bolls were about 7 to 20 days old. There were no consistent differences in sugar and starch content of leaves adjacent to the above bolls. The walls of bolls of various ages were lower in sugars and starches than the growing seed and lint during the first 11 to 13 days; from then on the percentages of sugars and starches increased, and at the age of 40 to 45 days the boll walls contained higher precentages of sugars and starches than did the nearly mature seed and lint. The pedicels and bracts of young bolls contained lower percentages of sugars and starches than the seed and lint.

In a series of defoliation and ringing experiments, Armstrong and Albert observed that first position bolls grew to a larger average size than did second position bolls. Bolls that had the adjacent leaves removed did not attain as large a size as comparable bolls with the adjacent leaves present. More shedding was noted in bolls on branches that had the ends removed as compared with those on normal branches. All of the treatments employed appreciably reduced the final size of the bolls.

Fiber investigations by H. W. Barre and Armstrong wherein fiber arrays were made from all bolls on each of 18 branches from plants grown in the greenhouse showed that there apparently was no correlation between lint length or uniformity and position on the branch from base to tip. A study of the bolls from each of 5 greenhouse plants having about the same conditions for development showed that there was no regularity in the percentage distribution of the different lengths of fibers under such conditions. Comparisons of bolls from the same relative positions on plants from fertilized and unfertilized field plats showed that fertilizers in this case had no effect on lint length. In general appearance the plants differed markedly, and those on the plat with no fertilizer exhibited decided symptoms of potash hunger. The individual seed from a single lock showed considerable variation in lint length and uniformity. Comparisons on the basis of the smallest percentage of fibers less than 1 in. showed that the best seed from standpoint of length of lint were 7, 8, and 9, numbered from base to tip of the lock. A difference of 7 or 8 days in the date of blooming between August 14 or 15 and August 22 gave bolls from the field with fibers which were noticeably different in

length. The earlier maturing bolls had appreciably longer fibers on plants both with and without applications of fertilizer. Comparisons of all bolls in the first position on fruiting branches showed no regularity in lint length or uniformity.

Cultural and fertilizer trials were carried on at the Pee Dee Substation by E. E. Hall and S. J. Watson. Acid-delinted and machine-delinted seed have given better stands and larger yields than undelinted seed over a period of years. Plantings April 1 to 15 have resulted in best yields over a period, although in 1930 March plantings were superior. Cotton broadcasted with a grain drill, cultivated 3 times with a weeder, and hoed produced 1,550 lbs. per acre of seed cotton on a fertilized area and 1,160 lbs. unfertilized. Over a period close spacing of plants in the drill gave a higher percentage at first picking and a greater total yield with all varieties. Cleveland cotton spaced 6 to 24 in. apart and receiving only three early applications of molasses poison averaged a bale or more per acre in all spacings, the highest yields coming from 6 and 9 in. Rows 3.5 ft. wide appeared best for station conditions. Cotton checked in hills 40 in. apart with 4 and 5 plants per hill made 1,711 lbs. of seed cotton, whereas chopped cotton with 1 and 2 stalks a hoe width made 1,882 lbs. and also yielded several hundred pounds more at first picking. Cotton picked in two pickings yielded 2,143 lbs. of seed cotton per acre and when all was open 1,923 lbs.

Sodium nitrate at the rate of 100 lbs. per acre has given its greatest gain applied 50 lbs. at chopping and 50 lbs. at first squares, and 100 lbs. at first squares came next. Nitrogen carriers used as side dressers ranked in production of seed cotton in the order sodium nitrate, urea, ammonium sulfate, Leunasalpeter, and calcium nitrate. In comparisons of winter cover crops (E. S. R., 64, p. 27), hairy vetch and monantha vetch were outstanding in the production of nitrogen for cotton. Cotton after the two vetches and Austrian Winter field peas plowed under made substantial gains over cotton getting no sodium nitrate and fair increases over that receiving 200 lbs. of sodium nitrate.

Different ways of applying fertilizer resulted in only slight yield differences, although yields were less when the fertilizer was applied after the cotton was up. Fertilizer placement studies showed the desirability of applying the fertilizer as close to the seed as possible without injuring germination.

Growing orchard grass in south Missouri, C. A. Helm (*Missouri Sta. Bul. 294 (1930), pp. 11, figs. 6*).—Methods of seeding orchard grass and of harvesting the crop for hay and seed and pasture practices in southern Missouri are outlined with comment on the grass in cropping systems and compared with timothy.

Experimental studies of muck soil as affecting seed and table quality in potatoes, E. V. Hardenburg (*Amer. Soc. Hort. Sci. Proc., 26 (1929), pp. 214–220*).—A number of potato varieties were grown on muck soil and on upland soil by the New York Cornell Experiment Station in 1928 and 1929.

Yields were consistently higher for all varieties on the muck soil, and all seemed equally well adapted for muck soil production. The spread of virus disease was the more pronounced in the muck-grown Early Ohio, White Rural, and Russet Rural and in the upland-grown Irish Cobbler and Green Mountains. There were more tubers per plant and higher acre yields in every case on muck soil. Muck-grown Green Mountain seed outyielded upland-grown seed significantly in two years' tests on both soil types, corresponding to the lower disease content in the seed from muck soil. Upland-grown seed of both Rural varieties outyielded the muck-grown lots by a considerable margin. Soil type

evidently did not result in consistent differences in seed value in the three early varieties. There was no definite effect of soil type on either starch and nitrogen content or starch-nitrogen ratio, and no definite relation of composition to culinary quality as affected by soil type.

HORTICULTURE

[Horticultural investigations at the Delaware Station] (*Delaware Sta. Bul. 167 (1930), pp. 30–35*).—Studies upon the causes of the dropping of immature fruits included observations on the relationship between curculio injury and abscission and led to the conclusion by L. R. Detjen and J. E. Vaile that plum curculio is not the causal factor but merely utilizes the fallen fruits for ovipositing.

Work in cabbage breeding under the direction of Detjen and Vaile yielded two new types, one resembling curly kale but with sessile leaves and the other resembling *Brassica asparagodes*. Wild cabbage strains from Wisconsin headed, whereas in Wisconsin they were entirely loose leafed.

In continuing the study of the relative value of various nitrogen sources for fertilizing peach trees Vaile, C. A. McCue, and Detjen found that a mixture of nitrate of soda and dried blood was very effective; much more so than either of these two materials used separately. Growth measurements by F. S. Lagassé upon Jonathan trees under differential fertilizer treatment showed marked changes in type and amount of growth produced in relation to the fertilizer applied. Austrian Winter peas proved a highly promising cover crop for peaches due to the fact that they may be sown after the peaches are harvested. Apple trees on seedling and own roots were indistinguishable in appearance. In some cases circumference increment was greater in one group and in other cases the opposite held true. In pollination studies Lagassé found the Delicious to be a good pollinizer for McIntosh, and McIntosh, Duchess, and King David excellent for Delicious. Actual brushing of the stigma with pollen greatly increased the set above that secured by simply bagging the blooms. Scarlet Pippin pollen produced no set on Delicious flowers. Cheesecloth seemed to prevent cross-pollination and gave better results than were obtained under paper bags.

[Horticultural investigations at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 12 (1930), pp. 33–39, 42–51*).—Of 16 varieties of tomatoes, the New Stone was found the most desirable. Comparing 2-, 3-, and 4-ft. spacings in the row for tomatoes, a slight advantage was obtained from 3-ft. placement. A 4–8–4 (N–P–K) formula proved most desirable for the tomato, with applications as large as 1,600 lbs. per acre profitable. Indications were seen that nitrogen should be derived from a quickly available material and potash from muriate. With watermelons the Stone Mountain variety led all others in production of marketable melons. March 1 plantings gave the highest yields of watermelons, and a suggestion was obtained that this crop responds to increased amounts of nitrogen and potash above those contained in the 4–8–4 formula. The Washington strain of asparagus was found best among five tested.

Arp Beauty was the most productive of 31 varieties of peaches. Excelsior proved to be a consistent bearing plum. Among pecans the Moore and Moneymaker were most productive. Only 2 of 16 northern varieties of grapes, namely, R. W. Munson and Agawam, survived, whereas all of 11 muscadine varieties thrived. Hunt was the most productive variety. The Young dew-

berry proved superior to Lucretia and Austin, and the Missionary and Klondike strawberries led. Among 9 varieties of figs planted in 1922 Celeste and Brunswick proved the most satisfactory. Jujubes did very well. The Van Fleet raspberry yielded light crops of inferior fruit, while Cuthbert, St. Regis, and similar varieties failed completely. Mersereau and Thornless were the most promising blackberries.

[Horticultural investigations at the Mississippi Station], J. C. C. PRICE and H. F. WALLACE (*Mississippi Sta. Rpt. 1930, pp. 25–27, 28, 44–46*).—Work in blueberry propagation is again cited (E. S. R., 64, p. 540). Tomato breeding activities included a selection of desirable seedlings from second, third, and fourth generations. Solar frames for forcing early plants, such as the sweetpotato, gave excellent results. Four species of ornamentals that failed entirely in flue-heated beds rooted in the solar frame. Glass was superior to substitutes in the heat absorption pits.

Cabbage and lettuce grown in the same pots responded differently to nutrients, the cabbage showing a greater response to increased nitrates and lettuce the greater response to increased water-soluble phosphorus. Neither species responded to increased concentrations of potash, whereas spinach did.

Among promising apples are listed Eckles, McBride, Rogers, Tucker, Hackworth, and Williams. The Gavin pear, discovered in southern Mississippi, was found highly resistant to blight. The sand pear, though highly resistant to blight, failed on account of frosts killing the early opening blooms. Nitrogen fertilizers slightly increased peach yields, delayed maturity from 3 to 5 days, delayed the abscission of leaves, and decreased winter injury. The leaf area of nitrated peach trees averaged $\frac{1}{17}$ acre per tree as compared with $\frac{1}{18}$ acre for the control trees. Acidity was the same on nitrated and control trees, and there was no difference in the refractive index. Lutie, Delaware, Diamond, Niagara, Catawba, and Menuch were satisfactory grapes. Fertilizers did not increase the yields of grapes. Hunt, Irene, and Memory were promising muscadine varieties. The best results in top working pecans were obtained with limbs 1 to 2 in. in diameter.

At the Raymond Substation Marvel, Globe, Norton, Richards, and Gulf States tomatoes produced the largest yields of marketable fruits. Foster, Globe, Marvel, Marglobe, and Louisiana Pink were most resistant to bacterial wilt. As a fertilizer for tomatoes, 1 ton per acre of a 3–10–3 produced the largest net profits and also the largest yield of marketable fruits. A combination of nitrate of soda and cottonseed meal proved the best source of nitrogen for tomatoes. Urea also gave good results, and there was no definite relation between source of nitrogen and the percentage of marketable fruits or earliness. A 2,500-lb. per acre application of nitrate of soda proved most profitable with this material. Cottonseed meal supplemented with a side dressing of 200 lbs. of nitrate of soda per acre proved desirable. No effect of either nitrogen or potash when used in a complete fertilizer was noted in the shipping quality of tomatoes sent to New York City. At least 4 per cent of potash is deemed desirable for tomatoes, except on soils with a red clay base.

On a 6-year average 1,000 lbs. per acre of 3–10–3 mixture proved most profitable for peas and beans, and nitrate of soda was the best source of nitrogen. World Record, Thomas Laxton, and Sutton Ideal produced the largest yields of peas and Giant Stringless of beans. Applications of 100, 200, 300, and 400 lbs. per acre of nitrate of soda as side dressings for watermelons increased yields correspondingly but had no consistent effect on the size. The greatest increment in the trunk growth of pecans was obtained with a complete fertilizer, although nitrate of soda was a close second.

[Horticultural investigations at the New York Cornell Station] (*New York Cornell Sta. Rpt. 1930, pp. 49, 50, 82–87, 97–99, 101, 102*).—In studies of the effect of mulch paper on the growth of gladiolus no striking effects were noted. Observations on a large collection of varieties of gladiolus showed a great deal of confusion in the nomenclature.

Wide fluctuations in the yield of apple trees in a single orchard were traced to differences in the soil, particularly drainage. The presence of free water near the surface in fall and spring is deemed a harmful factor in tree growth and performance. Indications were seen that cover crops should be turned under early in the spring before blooming because of their heavy draft on available nitrogen. Alfalfa mulch was less harmful in checking the growth of the tree than was nonleguminous material. Evidence was seen that applications of nitrate concentrated near the trunk were of more benefit than scattered applications. No substantial differences were seen in the effects of different nitrogen carriers. Placing colonies of bees and bouquets of bloom in solid blocks of McIntosh and Northern Spy increased the set in the McIntosh, but unfavorable weather influenced results in the Northern Spy block. Hand pollination of young trees cost about the same as thinning.

Pruning increased the size of the fruits the season immediately following, especially in heavy crop years. The invigoration following pruning was found to be associated with the condition of the tree and the fertility of the soil, there being little or no response in trees lacking in vigor.

Shredded oil paper was as effective as oiled wrappers in reducing apple storage scald and is deemed desirable for susceptible apples such as Rhode Island Greening. Girdling studies are again discussed (E. S. R., 64, p. 225). Evidence was obtained that the trunk and the larger branches of the tree are more efficient water conductors than are the younger branches and that this may account for part of the benefit of pruning older trees. Water loss from leaves reaching excessive proportions for short periods of the day, is believed to increase fruit dropping, and by reducing the efficiency of the foliage in carbohydrate synthesis may affect size, color, and quality of the fruits. It was found possible to increase greatly the nitrogen content of the growing points during the period of flower bud differentiation without materially increasing the percentage of differentiation. Increased nitrogen content increased the set of fruit.

Premature seeding of onions grown from sets was found to rest primarily on the size of the set and storage temperature. At or above 0.75 in. in diameter the percentage of seeding was large, irrespective of storage temperature. Large sets stored between 32 and 40° F. produced few seeders, those stored at from 40 to 50° a large percentage of seeders, and those stored above 50° few seeders.

The beneficial effects of pruning and training tomatoes were found to be associated with weather conditions, the results being such as to lead to doubt as to the commercial value of the operations. Tomatoes responded more to phosphorus than to any other fertilizing element. Asparagus, on the other hand, responded most markedly to nitrogen. Manure was not profitable for asparagus and in addition increased weeds.

On a Long Island soil the natural reaction of which was pH 5.3, increased acidity decreased the yields of potatoes, cauliflower, beets, spinach, and peas. For the potato there was only a narrow range between harmful acidity and harmful alkalinity. pH seemed to affect the quality of the potatoes. In cauliflowers there were noted varietal and strain differences in relation to acid tolerance.

The results of paper mulch studies indicated that long season, hot weather plants, such as tomatoes, peppers, and muskmelons, are benefited by the paper, the results with cabbage, potatoes, and beans being inconclusive. Soils that affected the color of onions in the field gave similar results when brought into the greenhouse.

[**Horticultural investigations at the Ohio Station**] (*Ohio Sta. Bul. 470* (*1931*), *pp. 96–121, 122–124, 125, 128–135, 227, 228, 230, 231, figs. 8*).—As reported by J. H. Gourley and Hopkins, nitrate of soda applied to apple trees in tillage and in sod increased the percentage of total nitrogen and the total amount of nitrogen in the fruit. The increase was more evident in the sod-grown apples but was significant in both cases. In the case of sod there was noted a gradual decrease in the percentage of nitrogen in the fruit throughout the season with all treatments, whereas the total amount of nitrogen increased. Fruit on the nitrated trees continued to increase in total nitrogen throughout the season, while in the controls total nitrogen reached a constant about midsummer. Catalase activity of the leaves was increased with nitrogen treatments, and a close correlation was observed between catalase readings on leaves and fruit and with the percentage of nitrogen in the fruit. H-ion concentration of the juice was apparently not influenced by nitrate applications, while total acid decreased to a minimum with 8 lbs. of nitrate per tree and further increased as the amount of nitrate increased. Total acid content of the fruit for all treatments decreased as the season advanced, although the decreases bore no relation to the treatment. No relationship was noted between nitrogen applications and the respiration rate of the fruit nor between nitrogen applications and the content of soluble pectin. Increased moisture content of the apples followed nitrating and showed a direct relation with the percentage of nitrogen. As the season progressed there was a gradual decrease in average moisture content with all treatments. Nitrating decreased the color of the fruit.

Yellow Transparent apples thinned to 1, 2, 3, and 4 fruits per spur when less than 0.5 in. in diameter retained 93.6, 84.6, 70, and 56.1 per cent of the fruits after the June drop, leading to the suggestion by F. S. Howlett of the possibility of thinning before the June drop and thus obtaining the response in size not possible with later thinnings. Observations by Howlett on the fruit setting of different flowers in Stayman Winesap clusters indicated that the individual blooms do not have equal chances of developing into fruit. The lower lateral bloom with leaf subtended appeared to be in a favorable position. Pollination tests showed Stayman Winesap to be fully self-unfruitful but to be adequately pollinized by Delicious, Jonathan, and Starking. Rome and Gallia Beauty were partially self-fruitful but benefited by cross-pollination, and were not satisfactory as interpollinizers. Cytological studies of Stayman Winesap blooms showed complete degeneration of all megaspores shortly after the second division, lagging of chromosomes in the first division with failure of several to be included in the two nuclei at interkinesis, and extra megaspores.

As reported by F. H. Ballou, sulfate of ammonia proved at the Clermont County Experiment Farm to be a better source of nitrogen for apples both in grass mulch culture and in tillage. Grass mulch produced larger yields than did clean culture and cover crops.

Spraying and dusting experiments conducted by Ballou and I. P. Lewis showed that the better quality dusts give as good control of scab as do sprays but are not equal in controlling codling moth. It was found that spray formulas may be often considerably reduced in strength below that recommended and thus reduce spray injury. Based on results at the Washington, Belmont, and

Mahoning County farms, Lewis concludes that dusting is about as expensive as spraying but may be more rapidly done. The new dust made up of 85 lbs. of dusting sulfur and 15 lbs. of superfine dry lime-sulfur was especially effective. Dusts containing over 15 per cent of hydrated lime rapidly decreased in effectiveness. Dusts containing 10 per cent of arsenate of lead were not as effective for the control of codling moth and curculio as were sprays containing 1.25 lbs of arsenate of lead per 50 gal. of solution. The addition of 5 lbs. of hydrated lime to each 50 gal. of spray reduced fruit russeting and leaf burning and seemed to invigorate the tree. Hydrated lime used alone at the rate of 9 lbs. to 50 gal. of water had some fungicidal value.

According to Lewis, complete covering of scions and stock favored an early start and better growth. Successful grafts were made every month except January from November to June, with March and April the best months.

Data obtained by Ballou on the operation of a stationary spray plant at Newark showed that sprays may be applied much more rapidly and at less expense than with movable outfits.

Spray residue removal studies by [C. S.] Holland showed the hydrochloric acid treatment to be most satisfactory if followed by thorough rinsing in fresh water. Without rinsing even very weak solutions of acid caused burning. The use of lime with the sprays decreased, whereas certain stickers increased, the arsenical residue. Washing improved the appearance of fruit without diminishing the keeping quality. Wrapping Golden Delicious apples was found by C. W. Ellenwood to reduce shriveling, and the time of picking was also concerned. Packing with shredded oil paper was also effective. The Cortland apple is deemed worthy of trial but not equal to McIntosh where the latter succeeds.

As reported by J. S. Shoemaker, Cumberland raspberries yielded more fruit when the laterals were pruned to 8 to 12 in. than to 6 to 8 in. The relation of nitrogen to firmness and composition of strawberries is again discussed (E. S. R., 64, p. 441). The Howard 17 strawberry proved a satisfactory pollinizer for Sample, the yields of Sample decreasing rapidly as the distance between the two varieties increased.

Improved types of the Livingston Globe and Marglobe tomatoes were developed by I. C. Hoffman, and two new inbred strains of the Abundance cucumber are deemed highly promising. Top-dressings of ammonium sulfate increased total and marketable yields of greenhouse tomatoes but had little effect on the percentage in the different grades. There was a tendency to increase earliness of maturity. December 3 proved superior to January 3 as time of seeding the spring tomato crop. Pruning tomato leaves cut yields in proportion to the severity of the pruning, even when such treatment was delayed until the first fruits were ripening.

Storage studies with seed beets led R. Magruder to recommend that roots should be dug about October 1, placed in storage at 40° F. for about 60 days, and then grown at 55° under a light exposure of at least 12 hours per day until the seed stalks appeared. Strain tests with the Detroit Dark Red beet showed a wide variation in color of the roots. A total of 26 varieties and strains of yellow sweet corn were tested, and a strain test of Golden Acre cabbage was carried on at Marietta and showed considerable variation in time of maturity and type. Three European strains were the earliest to ripen. The results of paper mulch studies at Marietta with various vegetable crops are discussed. Data on the results of celery fertilizer studies on a muck soil are presented by D. Comin and show the value of heavy feeding of this crop.

Vegetable fertilizer studies at Columbus conducted by H. D. Brown showed that spinach responds markedly to nitrate of soda, peas to muriate of potash and nitrate of soda, cabbage to superphosphate and muriate of potash, and carrots and potatoes chiefly to superphosphate. Tests for nitrates on the several plats showed a season's average of 12.8 parts per million on the no fertilizer plat and 22.7 on the nitrate of soda and muriate of potash plat. Superphosphate apparently depressed the amount of available nitrates. It is believed that a nitrate-nitrogen level of 20 parts per million should be maintained for spinach. Indication was seen by Brown and G. W. McCuen that subsoil treatment with the Killefer tool was beneficial for vegetables. Sowing fertilizer with pea seed was found harmful by Brown and Reed.

As determined by W. W. Wiggin, budded roses excelled own rooted roses for outdoor planting. In a trial of 12 varieties of gladiolus Wiggin obtained significant correlations between size of the corm and height of the spike in 8 varieties. Among results with the carnation Wiggin reports that trimming cuttings was not beneficial. Growing carnations in pots proved successful. Changing of the soil each year in raised benches was advisable. No yield differences were found between high and low pinched plants. Sunlight was a limiting factor in the nutrition of the carnation. Sophelia, White Eldora, Jewel, Pink Eldora, and Early Rose were the five best yielding carnations. The results of cultural tests with chrysanthemums are reviewed briefly. Soil reaction was found to have a pronounced effect on the color of the foliage and flowers and on the vigor of hydrangeas. Aluminum sulfate was found a good acidifier for the soil. Peat moss proved very beneficial for hydrangeas. The addition of nitrogen or of peat to the soil was found by A. Laurie to increase the percentage of double flowers in the stock, and abbreviating the length of day hastened the flowering of chrysanthemums and of Stevia. As reported by [L. C.] Chadwick, increasing the temperature of stored hardwood cuttings during the last two weeks before planting gave favorable results, but the position of the basal cut had little influence on the growth of roots. Cuttings taken in February and March rooted better than those taken earlier or later. Sand and peat proved a better storage medium than sand alone. H. C. Esper found that December 26 was a desirable date for taking evergreen cuttings. The value of $KMnO_4$ as a rooting stimulant was not evident. In most cases slag proved the best medium where bottom heat was not used, and a slag and peat combination gave better results than did sand and peat. Bottom heat proved more valuable with December and February cuttings than with those taken in November.

Observations by Ballou and H. S. Elliott in an apple orchard at the Clermont County Experiment Farm showed the desirability of removing filler trees at a reasonably early age. Pruning for a time counteracted the crowding tendency but was of only temporary value. Under conditions of cold weather filler trees apparently functioned to protect the blossoms in the orchard, since the loss of bloom was considerably less on the permanent trees in that part of the orchard in which fillers still remained. Under the condition of severe drought that obtained in midsummer the trees from which the fillers had been removed bore larger and better-colored fruit.

In observations at the Mahoning County Experiment Farm L. W. Sherman noted that if large, overgrown tomato plants were properly planted the results were almost as favorable as with normal plants set in the usual way. In the case of the oversized plants a considerable part of the stem was buried in a shallow trench.

[Horticultural investigations at the South Carolina Station] (*South Carolina Sta. Rpt. 1930, pp. 79–83, 84–87, 88, figs. 4*).—Continuing the pollination

studies with the apple (E. S. R., 62, p. 635), A. M. Musser and F. S. Andrews found that Delicious, Stayman Winesap, Arkansas Black, and Winesap were self-unfruitful, and that Stayman Winesap, Arkansas Black, and Winesap were ineffective pollinizers for other varieties. Gano, Ben Davis, Early Harvest, and Jonathan were partly self-fruitful and were adquate pollinizers for other varieties. None of the fruits dropping right after blooming was fertilized, it being apparent that fertilization occurred from 5 to 8 days after pollination, depending on the variety of pollen and other factors. Very few of the fruits abscising in the second general drop (from 10 to 13 days after pollination) had been fertilized. An examination of the June drop fruits showed only one or two normal seeds per fruit. The percentage germination and the rate of tube growth in artificial media were generally positive indexes to the pollinizing value of a variety. Stayman Winesap and Arkansas Black pollen varied considerably in size and shape.

Observations by Musser upon peach seedlings grown from natural seed showed that the size of the seedlings varied directly with the weight of the seed.

As determined by R. A. McGinty, L. E. Scott, and Musser, 1 ton per acre of 5-7-5 (N-P-K) fertilizer applied to asparagus directly after harvest gave the most profitable yields at Clemson College and at Monetta when supplemented by 200 lbs. of nitrate of soda before harvest. The value of complete fertilizers was evident. The time of application was a decisive factor, the post-harvest season giving the best results. Close spacing, 2 by 3 ft. and 2 by 4 ft., gave the largest yields, with indications, however, that quality tended to depreciate with such spacings.

Factors influencing the yield of Fordhook bush Lima beans were studied by McGinty and Andrews and indicated that temperature and humidity are more important than nutrient supply, and that hybridity is also a factor in the lack of fruitfulness. A spineless variety of okra was studied by McGinty in an effort to develop a desirable type. Considerable variation was observed in strains of Jersey Wakefield, Charleston Wakefield, and Copenhagen Market cabbages, the last of which proved an excellent variety for spring planting. Data are presented in tabular form on the yield of garden peas and snap beans. The Earliana and Bonny Best proved desirable tomatoes where wilt was not prevalent in the soil.

[Horticultural investigations at the South Dakota Station] (*South Dakota Sta. Rpt. 1930, pp. 27-29*).—In connection with the general report of activities descriptions are presented of a dewberry, two ornamental crab apples, and a rose deemed worthy of extended trial.

[Horticultural investigations at the Washington Station] (*Washington Col. Sta. Bul. 245 (1930), pp. 23, 24, 40-43, 44-46, 47, 60, 61, 62*).—As determined by J. L. St. John and J. R. Neller, considerable variation existed in the constituent substances of apples from year to year, and in fact the grade and position of apples on a tree are important in taking uniform samples. Sucrose increased during the growing season. Apparently too much significance has been placed on the small changes in acidity and too little on the alcohol insoluble acid-hydrolyzable fraction. Observations on Jonathan apples in the stage of breakdown indicated that catalase activity may be higher in the early stages and lower in the later stages of breakdown than in normal apples. Electrodialysis showed no essential difference between normal apples and those showing physiological breakdown. Neller found that apples coated with wax and oil could be more effectively cleansed with hydrochloric acid solution if given a preliminary treatment in methanol.

Measurements taken by E. L. Overholser and F. L. Overley on the ripening fruits of Delicious and Richared apples showed but slight difference in growth if grown under the same moisture, pruning, and thinning conditions. Observations by Overholser, Overley, and L. L. Claypool on winter injury resulting from low temperatures in the 1929 and 1930 seasons showed a direct relation between ground covers, such as snow and cover crops, and the amount of root injury. Young apple trees suffered especially from root killing, while older trees were more often injured at the crown. Drought in autumn accentuated winter injury. Laboratory tests showed that apple roots are injured at 17° F.

As reported by O. M. Morris and Claypool, the immersion of hardwood apple cuttings in various stimulants, such as nitrate of soda and ammonium sulfate solutions, failed to induce rooting. Studies by Morris and Overley of the distribution of apple roots in the soil showed that the number of roots per unit volume decreases with the distance from the trunk. The greatest number of small roots usually occurred in the top 18 in. of soil. The depth of root penetration depended on the nature of the soil and subsoil. Roots increased in number and dimension as the soil increased in fertility. The rate of water removal by the tree was apparently proportional to the number and uniformity of distribution of the roots. Soil moisture near the tree was reduced most rapidly. With young trees root concentration was not so marked near the trunk and hence not so harmful to cover crop growth.

Orchard fertilizer studies conducted by Overholser and Overley in the Wenatchee district showed considerable difference in color, yield, and size of fruit, condition of the trees, and cover crop growth as a result of fertilizers. Overley, Overholser, and Morris, working on irrigation of apples, found that the same amount of water was needed to saturate a soil whether applied by sprinklers or the rill system, except for differences due to evaporation in extremely warm weather. The sprinklers were more economical of water on slopes and on sandy soils. Overhead sprinkling reduced the amount of arsenate residue on fruits as compared with sprinklers under the tree.

Overley and Overholser found that the use of mineral oil and fish oil in combination with arsenate of lead made the removal of spray residues more difficult, especially when used after July 1. Observations by Morris on full ripe peaches harvested early, midseason, and late from the same orchard showed a decline in quality as time of ripening was delayed. The last lot was not only poorer in quality but also in shipping value. The temperature existing at harvest time and the amount of water in the soil apparently influenced the quality of peaches.

Pollination studies by Overholser and Overley showed Bing, Lambert, and Napoleon cherries to be both self and intersterile. Deacon, Waterhouse, Parkhill, and Priest No. 1 were good pollinizers for Bing. Successful results with pollen from 27 Deacon trees suggested the absence of strains in this variety. Priest No. 2, Parkhill No. 1, the Small Black Republican, and Deacon pollinized Napoleon satisfactorily, but Centennial was not compatible. Deacon was self-sterile but apparently was pollinated by Bing, Lambert, and Napoleon. The Anjou pear was partially self-fertile in north central Washington. Bartlett, Flemish Beauty, Winter Nelis, Easter Beurre, and Bosc were satisfactory pollinizers for Anjou, and reciprocally Anjou fertilized these varieties. Vigor of tree was an important factor in Anjou pollination.

Working on the respiration of strawberries, Overholser, M. B. Hardy, and H. D. Locklin observed among other points that fruits with firm flesh have a higher respiration ratio than do soft fruits, that respiration intensity increases with maturity of the fruit, that the initial firmness of the fruit as

well as respiration intensity is concerned in keeping quality, and that the specific gravity of mature strawberries averages slightly higher than that of immature berries.

Tomato breeding conducted by C. L. Vincent resulted in the development of desirable strains of Bonny Best × Sutton Best of All parentage. Firm, red ripe tomatoes were picked from each strain and stored in a greenhouse and showed a wide range in keeping quality, 16 to 41 days, as compared with 25 and 32 days for Bonney Best and Best of All.

At the Irrigation Substation Claypool found that cover crops greatly increased water requirements. Trees in the 12-hour cover crop area showed severe drought injury in some cases, whereas those in the 12-hour clean tillage plats were in good condition. Alfalfa yields were heavier as the amount of water applied was increased. As to the effect of pruning on size of the tree, size decreased in accord with the severity. Preliminary records in an Anjou pear orchard not yet fertilized showed a wide variation in the yield of individual trees. Hubam clover was the tallest growing of several cover crop plants tested. Winter injury observations showed the most injury in the lowlands where temperatures were lowest. Trees in poor soil were severely injured, and the southern and southwest sides of the trees suffered most. In relation to species response, injury ranged from complete killing of peach trees to no injury in plums. No difference was observed in the yield or earliness of spear production of asparagus in relation to the date that cutting ceased the preceding year.

[Report of the department of horticulture], H. D. Locklin and M. E. Hardy (*Western Washington Sta. Bul. 18-W (1930), pp. 12-18, fig. 1*).—Grapevines pruned to 20, 40, and 60 buds yielded 12.17, 15.84, and 16.86 lbs. of fruit, respectively. The weight of the prunings removed averaged 5.26, 4.45, and 4.68 lbs. dry weight. Comparing the four-arm Kniffen, Munson, fan, and upright horizontal systems of training, the average weights of prunings per vine were 4.23, 4.87, 3.69, and 3.51 lbs. and the average yields 14.87, 14.47, 11.73, and 9.77 lbs., respectively.

On a basis of 4 years' data taken in fertilizer experiments with head lettuce several commercial mixtures are recommended as being satisfactory. Cow manure and superphosphate gave excellent results in a single year's test. Tomato, sweet corn, and dahlia varieties were tested.

A study of senescence in the red raspberry cane, W. G. Brierley (*Minnesota Sta. Tech. Bul. 69 (1930), pp. 36, figs. 22*).—Histological studies of the canes of the red raspberry supplemented with similar observations on the Evergreen blackberry and the loganberry lead to the general conclusion that cambium in the red raspberry begins to decline in meristematic activity in the first season and is relatively feeble in the old canes. Apical meristem ceased to function at the end of the first season, no new winter buds were formed the second year, and cambium in the old cane formed relatively small amounts of new xylem and phloem elements. Measurements of new and old canes showed an increase in diameter in the central and tip regions in the second year, but in 90 per cent of the canes examined there was no measurable diameter increase at the base.

Cambial activity, as shown in the formation of new xylem, probably occurred to some extent in nearly all canes in the second year, being closely related to the vigor of the laterals. Xylem formation was not observed until the laterals had developed several leaves. Cambial activity progressed downward slowly from the point of bud insertion and was generally limited to the same side of the cane on which the shoot was borne. The easy breaking of laterals is

ascribed to this limited development of new xylem. However, where laterals were numerous there was noted a general activity of the cambium with the formation of a complete though narrow ring of new xylem. Cambial activity in the second year was limited in some cases to the maturity of the phloem initials cut off late the first year and to an increase in radial diameter of the remaining cambial cells. Degeneration of the phloem at the base and tip of the canes occurred at about the same time, the former being associated with senility of the cambium and the latter with unsatisfactory water supply. Observations on cuttings taken at various stages of growth showed further that meristematic activity begins to decline early in the first year and is exceedingly feeble in the second.

The tung-oil tree, W. NEWELL, H. MOWRY, and R. M. BARNETTE (*Florida Sta. Bul. 221 (1930), pp. 63, figs. 33*).—A general discussion upon the botany of the tree, its introduction into the United States, extent of Florida plantings, varieties, soil adaptation, cultural requirements, propagation, pruning, fertilization, harvesting, expression of the oil, control of pests, etc. Tabulated data are presented on the yields of individual trees at Gainesville and of temperatures endured by the species at Gainesville and at Tallahassee. Excessive liming of the soil badly stunted young nursery stock, and an excess of phosphate in the soil also caused injury even when the pH of the soil was satisfactory. Complete fertilizer gave the best results in yield and growth.

FORESTRY

[Forestry at the New York Cornell Station] (*New York Cornell Sta. Rpt. 1930, pp. 51–53*).—Records taken in four permanent sample plats at Ithaca showed that white pine outgrew red pine and Norway spruce in height and Norway spruce in diameter during the first twelve years. Weevils attacked 76 per cent of the white pine trees, but there were sufficient free trees and lightly injured trees to form a final stand of high quality. The net loss from weevil injury was not expected to exceed 10 per cent. No difference in weevil injury was noted whether Norway spruce or red pine was used as interplants for the white pine.

Data are presented on the mean annual increment of spruce, balsam, conifers, hardwoods, and combined conifers and hardwoods in five permanent plats. Further observations on the use of poisons for killing forest trees showed that a high concentration but small quantity of sodium arsenite is required. Pin cherry and aspen crowns and root systems were successfully destroyed with sodium arsenite. Crataegus was also successfully combated at moderate costs with the same poison. The loss of acorns because of rodents was such as to render fall planting of oak undesirable unless protection was provided.

[Forestry at the Ohio Experiment Station], E. SECREST, O. A. ALDERMAN, R. R. PATON, and R. T. BOWER (*Ohio Sta. Bul. 470 (1931), pp. 237–257, figs. 8*).—General information is presented on the administration of the State forests and parks, forest planting activities, distribution of planting stock, location of forest nurseries, forest utilization survey, extent and control of forest fires, etc.

Tree planting demonstration, A. N. HUME (*South Dakota Sta. Bul. 253 (1930), pp. 20–24, figs. 4*).—Of several species planted in 1916, elm and hackberry proved most satisfactory, yielding at 14 years of age trees approximately 9 in. in diameter at the base and 20 ft. tall. Hardy perennials, such as caragana and currants, also thrived. The methods of culture employed in the development of the plantation are discussed.

Evergreens in South Dakota, N. E. HANSEN (*South Dakota Sta. Bul. 254 (1930), pp. 33, figs. 8*).—Descriptions are presented of various conifers which

have been grown and tested in South Dakota, with notes as to their value, adaptability, utility, mention in the literature, etc.

Aspen: Availability, properties, and utilization, R. P. A. Johnson, J. Kittredge, Jr., and H. Schmitz (*Minnesota Sta. Tech. Bul. 70 (1930), pp. 72, figs. 25*).—A general discussion pointing out the vast quantities of aspen that exist in the cut-over region of northern Minnesota, Wisconsin, and Michigan and commenting on the nature of aspen wood and its adaptability for various uses.

Aspen is described as a rapid-growing, short-lived species that should be cut at an age of about 50 years, as thereafter decay increases very rapidly. The clear wood of aspen was subjected to various tests and because of its softness, uniform texture, white color, light weight, low shrinkage, and ease of gluing was found adaptable to many uses. Aspen wood weighs less than basswood and more than cottonwood and shrinks less than basswood and more than white pine. Aspen ranks low in most strength properties and should not be used where bending or compressive strength is a factor. Aspen had about the same nail-holding power as basswood and cottonwood, with little tendency to release nails by splitting, although the wood may be split easily with an ax due to the straight grain and low strength across the grain.

Pulping is said to offer a profitable outlet for aspen, since the species may be pulped by any of the standard processes and is at present used extensively in the production of soda pulp. Aspen is used in the manufacture of boxes, crating, and planing mill products, and is beginning to be used as flooring and interior trim. Aspen is more generally sold in the form of logs, bolts, and like products, is a recognized source of high grade excelsior, and when treated with preservatives makes acceptable crossties where light traffic exists. It is conceded much wider use might be made of aspen wood, as is now the case in Europe.

DISEASES OF PLANTS

[Report of the] department of plant pathology (*Delaware Sta. Bul. 167 (1930), pp. 35–44*).—No black rot-infected sweetpotatoes were noted by T. F. Manns on new soil as compared with a maximum of 0.5 per cent on formaldehyde-treated soil and 6 per cent on untreated soil. Slip seed of the Big Stem variety outyielded the best second seed by 67.3 bu. of primes per acre.

Incidental to a study of the control of diseases in shipped tomato plants, it was found that the method of dipping plants had a marked effect on subsequent injury. In a lot of copper sulfate-treated plants all died where the entire plant was submerged, while 60.1 per cent died where only the roots and stems were dipped.

The treatment of tomato seed with Ceresan failed to control stem rot in the seed bed, evidence being obtained that the disease is wind borne as well as soil borne.

No evidence was found that insects carry yellows or little peach.

Various new combinations of copper compounds and sulfur sprays were tested with some success for fruit spraying.

As reported by J. F. Adams, negative results were secured in the inoculation tests with material from overwintered leaves of cucumbers and cantaloupes.

A copper-lime-arsenate dust applied to soybeans completely controlled the Mexican bean beetle but injured the foliage to some extent.

Studies by Adams of cankers caused by bacterial spot of stone fruits showed that these are definitely delimited in the autumn by the formation of new surrounding tissues. Twig cankers were very shallow on the peach

and did not become perennial as in the case of the plum. Cankers were found to develop lengthwise rather than crosswise of the stem and were never found to girdle completely in the peach.

Determinations of the soil reaction in orchards where the disease was prevalent showed a pH range of from 4.7 to 6.32, with no evidence of any correlation between soil reaction and infection.

Hydrated lime in concentration of 15 lbs. to 50 gal. of water was found germicidal to *Bacterium pruni* at 1-700 dilution and with the addition of 0.5 per cent Penetrol at 1-1,400 dilution. Stone lime in concentration of 10 lbs. to 50 gal. of water was germicidal to *B. pruni* at 1-1,050 dilution, and the addition of Penetrol did not increase its efficiency.

Some indication was secured that spraying for the control of cankers as a source of spring infection was helpful in reducing injury to the fruit the following year.

The best control of apple fruit spot (*Phoma pomi*) was secured with 4 lbs. of colloidal copper to 100 gal. of water, but russeting injury was high.

Working with J. A. Trumbower, Adams found that combining Penetrol with calcium sulfide, Bordeaux mixture, copper oxychloride, and ethyl-mercury chloride removed any tendency to injure foliage of certain vegetables. The addition of Penetrol to calomel and Mercutox greatly increased their efficacy in preventing the germination of spores of *Sclerotinia fructicola*. Penetrol also increased the germicidal value of various other materials against *B. pruni* and *B. amylovorus*.

[Plant pathology at the Mississippi Station], L. E. MILES (*Mississippi Sta. Rpt. 1930, pp. 29-31, 41, 42*).—Excellent control of pecan scab was secured with both lime dust and liquid Bordeaux mixture. Comparing various sulfur-lime dusts with self-boiled lime sulfur, Dritomic sulfur, and dry-mix lime for the control of brown rot, scab, and curculio of the peach, the best results were secured with the self-boiled lime sulfur.

Some promising strains of oats showing resistance to crown rust were under observation.

Narcissus root rot was best controlled by immersion of the bulbs for two hours in a solution of bichloride of mercury.

A comparison of organic mercury disinfectants, formaldehyde, and bichloride of mercury for the control of gladiolus scab showed the bichloride of mercury to be most effective. Six hours of treatment was as effective as longer periods.

The treatment of cottonseed with various organic mercury and iodine disinfectants failed to show any beneficial results. Cleveland 54, Dixie Triumph, Miller, and Rhyne Cook short staple cottons and the Super Seven, Lightning Express, Watson, and D. & P. L. 6 long staple varieties proved promising on soils heavily inoculated with cotton wilt. Potash in well-balanced proportions with other ingredients was found to have an inhibiting effect on the development of cotton wilt when used in moderate quantities. Increased amounts per acre of such a balanced fertilizer over the normal rate of application did not give a corresponding decrease in wilt infection.

Seed-treatment tests made in cooperation with H. F. Wallace at the Raymond Substation showed iodine with Bentonite to be the best disinfectant for cotton.

[Plant pathology at the New York Cornell Station] (*New York Cornell Sta. Rpt. 1930, pp. 61-78*).—In potato-spraying studies it was established that progressively better control of hopper-burn was obtained with an increase in pressure, but the prevalence of aphids was also increased. Where precipitation and early frost were not limiting factors, leafhopper control increased

yields. A 300 lbs. pressure gave an average gain of 17 bu. per acre over 200 lbs. pressure, and 400 lbs. outyielded 300 lbs. by 36 bu. However, when the same quantity of material was applied at 200 lbs. as at 400 lbs., the increase was reduced from 36 to 18 bu. per acre.

The corrosive sublimate treatment of seed potatoes for scurf was found worthy. Calomel proved a promising substitute for corrosive sublimate, and yellow oxide of mercury was also found promising. Conditions immediately following planting materially influenced the results of seed treatment.

Roguing and indexing were found valuable in reducing virus infection in potato seed stocks.

Environmental conditions affected the external manifestation of various potato mosaics. The Russet Rural appeared more resistant than the Smooth Rural, and mosaic reduced the yield of Rural potatoes by 14 per cent.

Some indication was obtained that the prevalence of aphids affect the rate of infection by virus diseases.

In a study of the relation of soil acidity to dry root rot of the bean, it was found that beans grow well in soils with a range from pH 5 to 8. No correlation between root rot and soil acidity was noted.

No difference was observed in the action of the three strains of *Colletotrichum lindemuthianum* on culture media containing dextrose, sucrose, lactose, maltose, starch, cellulose, gelatin, and nitrates. None produced hydrogen sulfide.

Field studies in the control of late blight of celery suggested the possibility of obtaining commercial control by either copper-lime dust or Bordeaux mixture.

Calcium cyanide dust gave the best control of the tarnished plant bug, suspected of transmitting heart rot of celery.

In respect to Pythium wilt and root rot of lettuce, it was found that all varieties of lettuce tested and two wild species were susceptible, and that the pathogene overwinters in the soil. Bottom rot of lettuce caused by *Rhizoctonia* sp. was reduced by a thorough clean-up of lettuce fields after harvest. Calomel applications also showed promise as a control.

The mycelium of onion mildew (*Peronospora schleideni*) was found in the ovules, indicating the presence of the disease in the seed. Perennial mycelium was found in diseased bulbs.

Soil treatment with calomel offered promise in the control of pink-root disease of onions, the causal fungus of which was isolated and its pathogenicity established. The characteristic pink color was absent in acid soils.

A root rot of spinach was controlled by treating the seed with corrosive sublimate.

Studies of the nature and control of cork and drought spot of the apple indicated that the troubles are of nonparasitic origin and are due perhaps to a deficiency of water at critical periods.

The addition of an organic-mercury disinfectant to hot water apparently increased the control of loose smut in barley seed.

A mosaic disease of the lily was controlled by thorough roguing of diseased plants. Botrytis blight was most effectively controlled by dusting the plants with copper-lime dust.

Botany and plant pathology [at the Ohio Station] (*Ohio Sta. Bul. 470 (1931), pp. 57–78, figs. 6*).—The absence of apple scab in 1930 due to the drought rendered the results of control investigations by H. C. Young and C. May of little significance, though some indication was observed of the value of the 85–15 sulfur-finely ground dry lime sulfur and the 85–10–5 sulfur-manganar-anhydrous aluminum sulfate dusts.

A case of severe defoliation and fruit injury to apples following applications of a 1–80 liquid lime sulfur and 1.5 lbs. of lead arsenate to 50 gal. of the spray was traced to the high percentage of water-soluble arsenic present. Laboratory studies by Young, the results of which are presented in tabular form, showed that various correctives, such as lime, reduced the amount of water-soluble arsenic in proportion to the dilution of the spray. A mixture of lime sulfur and lead arsenate produced a black sludge (lead sulfide), during the formation of which arsenic was freed.

As reported by J. D. Wilson and Alexander, the orientation, design, and management of the greenhouse had considerable function in the development of tomato leaf mold. Pruning of the lower leaves did not affect the development of this disease.

Semesan was found by P. E. Tilford to be an effective disinfectant for aster seed supposed to carry wilt. Attempts to repel leafhoppers from asters with dusts and sprays were not highly successful but did delay the onset and reduce the severity of yellow injury.

Some indication was found that the treatment of calla lily corms with mercuric chloride would prevent a root rot caused by *Phytophthora* sp.

Calomel and certain organic mercury compounds were found effective in reducing scab injury on gladiolus corms.

Spraying and dusting of potatoes gave large increases in yield above the controls in all cases. A good quality of high-calcium hydrated lime was equally as effective as stone lime in the preparation of Bordeaux mixture. Drought apparently accentuated the value of sprays, since the unsprayed plants succumbed much earlier.

Outbreaks of Verticillium wilt of tomatoes grown in greenhouses near Cleveland were traced by Alexander to the use of an unsterilized soil which had been used for growing solanaceous plants. It is believed that infection takes place through the root system. Successful inoculations were made by wounding the main stem and inserting fragments of a Verticillium culture.

Observations are presented by May upon the symptoms, appearance, and control of the Dutch elm disease (*Graphium ulmi*), newly discovered in America and considered a serious menace.

The Cenangium blight of pine was found attacking young Himalayan pines on the station grounds.

Applications of gypsum-calcium arsenate, gypsum-calcium arsenate followed by Bordeaux mixture, and hydrated lime-lead arsenate were found by Wilson to control diseases of the cucumber, but where applied frequently during the early life of the plants often caused stunting.

Formalin applied in dust form with kaolin and infusorial earth gave better control of onion smut than did liquid formalin. Greenhouse trials indicated that under conditions of high soil moisture at planting time the dusts are more efficient than liquids.

The optimum temperature for host and disease in the case of onion pink root was found by Wilson to be 24° C. Applications of lime had but little effect on the disease, although plants were stunted with an application of 6 tons per acre. Increasing the acidity with sulfur and with aluminum sulfate checked the disease slightly, but root growth was decreased by the use of sulfur. The best growth was on the check plats.

Some indications were obtained by Wilson that maintaining the relative humidity in a greenhouse at a point below the critical stage for infection of the tomato by leaf mold reduced the chances for infection.

Tests by Alexander and Young of the efficacy of fertilizer and salt in reducing *blackroot of the beet* were inconclusive, but both salt and nitrate of soda side dressing were sufficiently promising as to be further tested.

Studies by L. M. Cooley of a stunting trouble observed in the Premier and Gibson varieties of strawberries failed to reveal the causal agent, which is suspected of being a virus. In a few cases the plants recovered without treatment.

As reported by Cooley, it was found that a properly executed program of isolation, inspection, and roguing would maintain black raspberry plantings practically free from virus diseases. The distance to which viruses were apparently carried by insects ranged from 100 to 440 yds.

The results of determinations by R. C. Thomas of the phenol coefficient value of Ceresan and IN-8 are presented and discussed.

The outer covering of the hyphae of *Sclerotinia sclerotiorum* was found by Thomas to be a carbohydrate that could be readily dissolved in dilute sodium or potassium hydroxides after fatty acids and phosphatides had been removed. The chemical nature and reactions of the new substances are discussed. The product obtained by precipitating the carbohydrate from alkaline solution, as a copper complex, with copper sulfate was used in a hydrolysis study, from the results of which it is concluded that the carbohydrate found in *S. sclerotiorum* agrees very closely with callose, a material supposed to be present in a large number of species of fungi, frequently replacing cellulose.

Of three materials, Smuttox, Ceresan, and copper carbonate, tested by J. D. Sayre for the control of oat smut, the first gave almost complete control. Treatment of seed corn with Semesan and Merko gave no significant results.

[Plant pathology at the South Carolina Station] (*South Carolina Sta. Rpt. 1930, pp. 45, 46, 103, 121, 122*).—As reported by G. M. Armstrong, the drought of 1930 affected the prevalence of various plant diseases, reducing the amount of late blight of potatoes and bacterial blight and anthracnose of beans.

A rather harmless Phyllosticta leaf spot was found in 42 per cent of the tobacco beds examined. In the field there was found mosaic, ring spot, angular leaf spot, frog-eye, bacterial wilt, sore shin, hollow stalk, root knot, frenching, potash hunger, sand drown, and black fire of tobacco. Of these mosaic was the most serious from an economic standpoint. Heavy losses of seedling cotton were observed in the Piedmont area in May and June but could not be associated with the soil reaction.

In studies by E. E. Hall and S. J. Watson at the Pee Dee Substation, the treating of cottonseed with Ceresan increased the number of plants per acre with acid-delinted and machine-delinted seed and slightly with normal seed.

Applications of sulfate of magnesia to tobacco seedlings suffering from sand drown restored them to normal condition. The inoculation by W. B. Albert of tobacco with mosaic virus resulted in 100 per cent infection and complete loss.

[Plant pathology at the Washington Station] (*Washington Col. Sta. Bul. 245 (1930), pp. 16, 17, 43, 47-50*).—Five physiologic forms of bunt were determined by E. F. Gaines, H. H. Flor, and W. K. Smith in inoculation tests on 40 varieties of winter wheat and 34 varieties of spring wheat. Certain varieties of both groups of wheat were shown to be resistant. Inoculation of 10 winter wheats by bunts collected in 1929 suggested the presence of new forms.

Inheritance studies in cereals by Gaines and Smith revealed some promising selections possessing resistance to bunt. Using Hope, a spring wheat of demonstrated resistance to all forms of bunt when spring sown, as one parent, it

was found that the factors in Hope that give resistance to the various forms of bunt are identical.

Tests of 11 oat smut collections on 7 varieties of oats showed no difference sufficient to mark the number of forms present. Markton was immune from all the collections. From crosses between Markton and hull-less varieties there were obtained 7 fourth-generation and 16 fifth-generation selections both hull-less and immune from covered smut.

As determined by E. L. Overholser and F. L. Overley, the quick-breaking type of oil emulsion 4 per cent strength or stronger resulted in injury to fruit and leaf buds when applied during the critical stage of bud development and opening. The stable emulsion types of oils and lime sulfur caused no injury when applied to trees with buds in this critical stage of development. The application of summer oils previous to July 1, following a delayed dormant spray of lime sulfur, injured both the fruit and the leaves. More than three covers of summer oils of medium to heavy viscosity applied to well-loaded trees resulted in a decrease in the size of the fruit and a poor set of buds and fruit the following year as compared with arsenate of lead spray.

A list is presented by F. D. Heald and G. D. Ruehle of fungi which were isolated from cold storage apples and which were found to cause either slow or rapid decay. Among the measures tested for the control of blue mold was ozone storage, with negative results.

Winter injury studies by Heald showed very heavy killing back of old sweet cherry trees in the lower Yakima Valley, whereas younger trees showed little or no injury. No constant differences in the hardiness of the commercial varieties were noted. Injury to apple trees was sometimes evidenced only in the size and quality of the apples produced.

Applications of Semesan for Rhizoctonia disease were found by L. K. Jones to increase slightly the percentage germination of Surprise but had no effect on Alaska peas.

Tomato streak was found to be readily transmitted in the greenhouse by cultural practices, and care in washing the hands greatly retarded spread. Streaked plants produced 44 per cent less fruit than did healthy plants. It is believed that the disease does not live in the soil.

Mosaic disease was found to be widespread in the beet plantings in the Mount Vernon area. Seedlings grown 300 ft. or more from the mother beets were relatively free of the disease.

Several newly discovered plant diseases are reported by Heald, Jones, and G. A. Newton.

[Report of the department of plant pathology], G. A. NEWTON (*Western Washington Sta. Bul. 18-W (1930), pp. 18-21*).—Observations on black and red raspberries purposely planted with a diseased individual in every tenth hill showed that the black raspberry is much more susceptible to virus diseases than the red; in fact red raspberry plants upon which aphids from diseased plants were confined showed no noticeable symptoms, whereas black raspberries inoculated in the same manner developed definite symptoms. It is suggested that black raspberries be planted at least 300 ft. from red varieties and that they should be frequently rogued to eliminate diseased plants.

Western bluestem (*Verticillium alboatrum*) was not found prevalent in black raspberry plantations except where raspberries had immediately followed potatoes. Soil inoculated with this disease apparently conveyed it to raspberry plants.

A study of isolations made from areas of the inner leaves of lettuce just beginning to show small spots of dead tissue near their margins showed in

some cases a very high bacterial count as compared with isolations from healthy tissues, yet in the majority of cases the bacterial count was practically the same in healthy and in spotted tissues, leading to the deduction that bacterial slime rot may follow the spotting but is not necessarily the cause. The occurrence of considerable loss, as great as 50 per cent in some instances, from lettuce drop (*Sclerotinia sclerotiorum*) leads to the suggestion that lettuce should be grown in a rotation including a few years' growth of resistant crops, such as peas, cabbage, cauliflower, carrots, onions, and spinach.

Downy mildew (*Pseudoperonospora humuli*) caused considerable injury to hops in the Puyallup Valley and leads to the suggestion that all diseased parts of plants should be destroyed and the new growth sprayed with Bordeaux mixture.

Studies on the nature of physiologic resistance to Puccinia graminis tritici, W. N. Ezekiel (*Minnesota Sta. Tech. Bul. 67 (1930), pp. 62, figs. 11*).—Considerable and consistent differences were found in the growth of uredinial germ tubes of different physiological strains of *P. graminis tritici*, indicating that these differences may be used in identification, but it is conceded that many more isolations must be made before it can be concluded definitely that the characteristics observed in drop cultures always correspond with pathogenic characteristics.

There was a high positive correlation between the number of urediniospores with which a drop was seeded and the final length of germ tube per spore. Apical swellings resembling teliospores morphologically were produced on the tips of germ tubes by all forms of all species studied. The production of these bodies was correlated negatively with the number of spores per drop. Teliospore-like bodies were produced by the physiologic forms of *P. graminis tritici* under identical conditions on a purely synthetic medium, plain 1 per cent agar, at rates relatively constant per form and widely varying between forms. For almost all the forms tested the rates varied in linear correlation with the extensiveness of the host ranges of the forms.

Extracts prepared from wheat varieties differed in their ability to support the growth of physiologic forms of *P. graminis tritici* in exact agreement with the respective resistance or susceptibility of the varieties to the various forms. This congeniality was evidenced by greater lengths of germ tubes in extracts from susceptible varieties, less branching, and lower production of apical swellings.

Extracts stored for eight months at low temperature still retained the properties that differentiated between forms to which the variety concerned was susceptible or resistant. Extracts prepared by methods involving heating apparently did not contain the materials affecting germ-tube elongation. Materials extractable from normal as well as infected wheat tissues were able to affect the growth of physiologic forms of *P. graminis tritici*, in artificial culture in the extracts, in a manner diagnostic of the resistance of the host to the various physiologic forms.

Studies on bacterial canker of tomato, M. K. Bryan (*Jour. Agr. Research [U. S.], 41 (1930), No. 12, pp. 825–851, pl. 1, figs. 18*).—Bacterial canker of the tomato, caused by the organism *Aplanobacter michiganense*, is characterized by stunting of the plants; gradual wilting and irregular dying of the leaves; streaking and cracking open of the stems, petioles, and veins; and the final collapse of the entire plant. Death of the plants occurs at any stage from the seedling to the mature plant and ranges as high as 100 per cent in some instances. During the wet seasons the canker causes a disfiguring fruit spot which renders the fruit unmarketable but does not cause decay. The spots are numerous, small, and characterized by white halos.

Control was found difficult, since the bacteria enter the fruit and penetrate the seed through the vascular system. Hot-water treatment was found impracticable, since temperatures sufficiently high to kill the bacteria approached the injury point of the seed. The best control measures consist in obtaining seed from fields free from the disease. Seed bed sanitation is also important, since spread is possible at this stage. Rotation of crops is advised, as it was found that bacteria were able to overwinter in the soil in certain parts of the country.

The cultural and physiological characteristics of the organism are given, and two variants, one an albino, are described.

Combating damping-off of tomatoes by seed treatment, J. G. Horsfall (*New York State Sta. Bul. 586 (1930), pp. 22, figs. 2*).—As shown in tests conducted at Geneva, Brockport, Sheridan, and Dunkirk, tomato seed soaked in a copper sulfate solution for periods ranging from 10 minutes to 24 hours gave marked increases in stand and freedom from disease in the resulting seedlings. Tomato seed was soaked in a 7.2 per cent solution of copper sulfate for 22 hours without injury, whereas seedlings were injured by a 0.5 per cent solution applied to the soil at the rate of 1 qt. per square foot.

Dusting tomato seed with copper carbonate also increased stands and freedom from disease but was not as effective as soaking in a copper sulfate solution. Other materials tested with some degree of success include cuprous oxide, cuprous chloride, cuprous bromide, cupric oxalate, cupric tartrate, and cupric oxide, all used as dusts. Cuprous cyanide caused serious injury to the seed. Treatments with calomel, mercuric sulfide, mercuric oxide, mercuric iodide, Semesan, Ceresan, and Dip Dust were not successful, causing injury in many cases. Tomato seed is apparently quite sensitive to mercury poisoning.

Effect of seed-potato treatment on yield and rhizoctonosis in Florida from 1924 to 1929, L. O. Gratz (*Florida Sta. Bul. 220 (1930), pp. 34, figs. 2*).—Experiments conducted over a period of years with Spaulding Rose No. 4 potatoes showed only a few instances of significant gains in yield resulting from the treatment for the control of rhizoctonosis (*Corticium vagum*). On the other hand, there were several cases where an appreciable decrease in yield was recorded. The addition of control materials to the soil gave very harmful results in a single season's trials. Records of injury from the disease showed but little injury, even with untreated seed, and led to the conclusion that the use of corrosive sublimate, hot formaldehyde, or organic mercury compounds is not justified in the Florida potato belt despite favorable results obtained elsewhere from the use of certain of the materials.

A list of 92 references to literature cited is appended.

The relation of some tobacco viruses to potato degeneration, W. D. Valleau and E. M. Johnson (*Kentucky Sta. Bul. 309 (1930), pp. 473–507, figs. 5*).—Believing that certain of the tobacco virus diseases were originally derived from diseased potato plants through the medium of insects and solanaceous weeds, the authors made various cross inoculations between the tobacco and the potato, the results of which are discussed in detail. Evidence was secured that at least one of these virus diseases of tobacco is caused by a virus commonly present in Irish Cobbler potatoes affected with mosaic, and that certain other tobacco viruses are capable of causing disease in potatoes.

The suggestion is also presented that potatoes may have acted as agents in the dispersion of cucumber mosaic virus. Since the aphid, *Myzus persicae*, rarely, if ever, transmits the healthy potato virus, while it regularly transmits the vein-banding virus from virus mixtures, the authors suggest that this insect might be used to separate vein banding, cucumber mosaics, probably

the etch viruses, leaf roll, and possibly other viruses from mixtures with the healthy potato virus. The proper recognition of the importance of weed hosts, together with the development of potato seedlings free from viruses, is conceded a possible solution of the potato virus problem.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A history of applied entomology (somewhat anecdotal), L. O. Howard (*Smithsn. Misc. Collect., 84 (1930), pp. VIII+564, pls. 51; rev. in Science, 73 (1931), No. 1885, pp. 186–189; Jour. Econ. Ent., 24 (1931), No. 1, pp. 335, 336*).—Following a brief preface and an introduction to this work, which is considered editorially on page 601 of this issue, the author deals with the subject in seven parts as related to (1) North America (pp. 9–198); (2) Europe (pp. 199–336); (3) Asia (pp. 337–363); (4) Africa (pp. 365–379); (5) Australasia and the Pacific (pp. 381–416); (6) South and Central America and the West Indies (pp. 417–462); and (7) medical entomology, the international use of parasites, and other matters (pp. 463–545). An index to individuals is included (pp. 547–564).

The reviews, respectively, are by T. D. A. Cockerell and E. P. Felt.

A history of entomology, E. O. Essig (*New York: Macmillan Co., 1931, pp. VII+1029, figs. 263*).—The several chapters of this work, which is considered editorially on page 602 of this issue, deal with (1) prehistoric entomology (pp. 1–11), (2) California Indians in relation to entomology (pp. 12–47), (3) historical background (pp. 48–53), (4) principal institutions in California featuring entomology (pp. 54–81), (5) some historical facts concerning the more important orchard mites and insects of California (pp. 82–273), (6) the biological control of insect pests (pp. 274–402), (7) insecticides (pp. 403–501), (8) entomological legislation (pp. 502–538), (9) biography (pp. 539–810), and a chronological table showing the development and progress of entomology in relation to history and other sciences (pp. 811–952).

Rat proofing buildings and premises, J. Silver, W. E. Crouch, and M. C. Betts (*U. S. Dept. Agr., Farmers' Bul. 1638 (1930), pp. II+26, figs. 23*).—This practical account is presented under the headings of general principles of rat proofing, rat proofing farm buildings, rat proofing city buildings, and rat proofing the city. Drafts of model rat-proofing ordinances are included.

Red-squill powder in rat control, J. Silver and J. C. Munch (*U. S. Dept. Agr. Leaflet 65 (1931), pp. 8, figs. 2*).—A brief practical account of red squill for use in rat control, based on U. S. D. A. Technical Bulletin 134 (E. S. R., 62, p. 446).

[Report of the department of entomology], L. A. Stearns and L. L. Williams (*Delaware Sta. Bul. 167 (1930), pp. 24–30*).—The work with the codling moth at the Camden and Newark insectaries (E. S. R., 62, p. 753) was supplemented by general observations on development in the orchard, a digest of which is presented. Work carried on in December in which the rough bark was scraped from a block of 1,200 apple trees varying in age from 20 to 35 years in an orchard at Camden at a cost of 6.5 cts. per tree, indicates that scraping is highly efficacious as a supplemental measure in codling moth control, but equally ineffective in the control of the oriental fruit moth. Apple drops in the Bridgeville district averaged less than 1 per cent for the Transparent and 32 per cent for the Williams variety of the larvae present, indicating the desirability of a post-harvest clean-up in the case of the latter variety.

Brief reference is made to a study of the bionomics and control of the grape leafhopper, which was abundant throughout the State, parasitism being ineffective in curtailing its activities. Overwintering adults were present in considerable numbers and were just becoming active on April 16, at which time the grape buds had pushed out about 0.25 in. The peak of abundance for the first brood nymphs occurred on June 23 and for the first brood adults July 9. A reduction in numbers estimated at 75 per cent resulted from the spray application on June 13 of a 40 per cent nicotine sulfate at the 1 to 800 dilution in combination with Bordeaux mixture 6-12-100 and 3 lbs. of dry arsenate of lead.

In work on the bionomics and control of the plum curculio, which was commenced in the spring of 1928, the pest was found at Newark and Camden to be single brooded in 1928 and 1929, but at Bridgeville a partial second brood developed in 1929 and caused severe injury late in the season. It appears that climatic factors are not responsible for the development of the second brood, suggesting that there are two strains of curculio—the first one-brooded and the second two-brooded. "In Sussex and Kent Counties the first curculios emerged from hibernation on April 15 in 1930 as compared with April 6 in 1929 and April 21 in 1928. In New Castle County, on the other hand, first emergence was delayed until May 5. Maximum emergence occurred between May 5 and 10 in Sussex County, on May 21 in Kent County, and May 15 in New Castle County. As in 1929, first emergence was recorded at the time of the petal fall spray, and curculios were present in greatest numbers during the interval in which protection was afforded by the shuck and first cover sprays. Last emergence for the several counties occurred on June 25." Records of drop infestation for both 1929 and 1930 indicated that approximately 90 per cent of the first brood grubs are contained in the major peach drop occurring during the last 10 days in May, the figures for drop infestation emphasizing the necessity of picking up in the control of the curculio.

In a further study of the oriental fruit moth, which causes considerable annual loss in the State both of peach and apple, parasitism by *Macrocentrus ancylivora* Roh. of the first brood larvae was found to average 73 per cent for collections in the Camden district the last week in May. Collections and rearings of strawberry leaf roller larvae in the same area failed to indicate parasitism by *M. ancylivora*, from which host it was originally described.

Annual report of the department of entomology, R. W. HARNED (*Mississippi Sta. Rpt. 1930, pp. 18-22, fig. 1*).—In studies of the pecan bud moth the life cycle from egg to adult in each of three cases was found to be 34 days. Evidence of three generations was found, no larvae having been detected on pecan trees in 1929 later than August 13.

In a study of the hickory shuck worm on pecan, covering the shucks in March appeared to prevent the emergence of most of the moths from overwintering larvae It was found that the first generation of this insect may be passed on pecans, but where hickory trees are near pecan groves there will probably be some migration. There were at least three generations of the shuck worm on pecan at the station and probably four in the southern part of the State.

The work of the year with the cotton aphid, in continuation of that of the preceding year (E. S. R., 64, p. 454), indicates that the continued use of nicotine dust on cotton is slightly detrimental.

[Report of entomology at the Ohio Station] (*Ohio Sta. Bul. 470 (1931), pp. 79-95*).—In continuation of the work with the European corn borer (E. S. R., 63, p. 50), the work of the year is reported under the headings of infestation in

1930, by J. R. Savage and C. R. Neiswander; seasonal behavior, by E. G. Kelsheimer and Neiswander; some causes contributing to decrease in corn borer infestation, by L. L. Huber and Savage; influence of host development on establishment, by J. B. Polivka and Huber; competition as a factor influencing corn borer survival, by Neiswander and Huber; varietal resistance, by E. A. Herr and Huber; varietal tolerance to corn borer attack, by Herr and Neiswander; larval migration, by Neiswander and Polivka; control with insecticides, by Polivka; and effect of colored lights on the behavior of corn borer moths, by Kelsheimer.

An account of potato flea beetle control work, by H. L. Gui, includes a report in tabular form on the value of lead and calcium arsenates used in Bordeaux mixture in flea beetle control at Wooster. The results obtained indicate that the effectiveness of the arsenicals is short lived. The yields of potatoes from plats receiving the arsenicals at the rate of 4 lbs. to 100 gal. of Bordeaux for the first three applications were somewhat increased over the yield of the plat on which Bordeaux alone was used. Where the arsenicals were included in the first six applications, a considerable increase in yield resulted. In all cases calcium arsenate gave higher yields than lead arsenate when applied under like conditions.

In work with white grubs in lawns and flower gardens, G. A. Filinger found that a solution prepared by dissolving 8 or 10 oz. of sodium cyanide in 50 gal. of water is an effective remedy in controlling white grubs if sprinkled over the infested area at the rate of 2.5 gal. per square yard. The solution should be thoroughly washed off the plants one or two hours after its application in order to avoid injury.

It was found by Filinger that a sodium cyanide solution prepared by dissolving 10 oz. of sodium cyanide in 50 gal. of water, the solution being applied by pouring it on at the rate of 2.5 gal. per square yard of surface, is very effective in ridding the turf or flower garden of earthworms. A stock solution may be prepared by dissolving the sodium cyanide at the rate of 5 oz. in a quart of hot water. Many earthworms come to the surface following the treatment and these should be collected and removed to prevent the poisoning of birds or fowls.

Brief accounts of field and laboratory experiments with the onion maggot are reported upon by J. P. Sleesman. Observations indicate that the early planted and thickly seeded onions receive a heavier egg deposition, and that they probably are more attractive to the adults. Observations indicate that a high soil-water content is essential to a high rate of larval establishment. Laboratory tests with a number of insecticide materials indicate that 2 per cent lubricating oil emulsions give the most efficient control of the maggot.

From observations on the breeding of the plum curculio in fruits thinned from trees, by C. R. Cutright, it has become apparent that the practice of dropping insect injured fruits to the ground is quite favorable to the plum curculio.

In tests by Cutright with nicotine spreaders and activators in work with the apple aphid, potassium oleate, sodium oleate, and an oxidized oil known as Penetrol were found quite efficient in increasing the toxicity of nicotine. The most effective dilutions found were sodium oleate and Penetrol at 0.5 per cent, potassium oleate requiring a slightly higher concentration, usually from 0.75 to 1 per cent. Both oleates are very hard to dissolve in water, and it is thought that their use on a large scale would be almost impossible because of this character. Penetrol, however, is a free flowing emulsion which readily mixes with water. Because of the excellent results obtained when Penetrol was used

with the nicotine sulfate at dilutions of 1 to 4,000 in the laboratory, tests of the effectiveness of this combination in the field were commenced, the results of which are presented in tabular form. They indicate that the higher the temperature the greater the mortality of the aphids, except in cases where the foliage is so severely curled that the spray can not reach them. The results show that Penetrol and low strength nicotine have decided promise for use in the field.

Field and laboratory experiments with the codling moth, by Cutright, are briefly reported upon. It appears that a single application of the standard lead arsenate-lime-sulfur combination is still the best control for this pest. An experimental study of the effect of different temperature levels on the ability of young codling moth larvae to make entrances on sprayed and unsprayed fruit showed that the higher the temperature within seasonal limits the greater the percentage of larvae that were able to injure the fruit, either sprayed or unsprayed.

The work with the oriental fruit moth, reported upon by R. B. Neiswander and M. A. Vogel, deals with infestation, hibernation, parasitism, and control. An examination made for hibernating larvae in picking baskets in a storage shed resulted in the finding of 190 in 25 baskets that were carefully examined, the winter mortality of which was less than 9 per cent. Careful examination of three peach trees in cultivated orchards resulted in the finding of 301 hibernating larvae, 20 per cent of which were within the reach of an application of paradichlorobenzene, and 43 per cent were on the ground. The mortality among the larvae on the ground was 53 per cent as compared with 79 per cent among those on the trees. In a study of parasitism, collections of twig-feeding larvae from 16 orchards, representing 11 counties in southern, central, and northern Ohio, showed an average parasitism of 14 per cent for the year 1930. It is pointed out that most of these larvae were collected in May and June, while records taken in an orchard near Wooster showed parasitism of twig-feeding larvae to have increased from 2 per cent on June 4 to 47 per cent on August 12, with an average of 20 per cent. A parasite not previously listed, namely, *Macrocentrus delicatus* Cress., was found during the year to be quite common in the southern and central parts of the State. A total of 18 larval and pupal parasites of this pest have thus far been recorded for Ohio.

In a series of dormant insecticide tests for hibernating larvae cocooned on sections of the trunks and larger limbs of peach, good control was obtained from the application of tar acid oil and carbolinium at the rate of 12.5 and 16 per cent, respectively, but both of these materials caused considerable injury to dormant trees. The results obtained in a series of spraying experiments on Elberta peaches indicate that summer oils applied late in the season are more effective than heavy lime sprays early in the season. The fact that the peaches which had received oil late in the season had a deeper color and were delayed about two days in the ripening, enabling the growers to sell on a better market than those which had received no oil, was of considerable interest to the growers. The treatment which gave the best results consisted of 25 lbs. of hydrated lime in the shucksplit and 2-week sprays and Verdol at the rate of 1 gal. to 50 gal. of water in four applications at 10-day intervals beginning on July 28. The average visible injury to the fruit from the three plats receiving this treatment was 80 per cent less than in the three plats receiving the standard treatment for peaches in Ohio. Seven applications commencing May 20 of a dust composed of 95 lbs. of hydrated lime (300 mesh) to 5 lbs. of a summer oil gave a reduction in visible injury in Elberta peaches of 71 per cent over the most heavily infested plat in the orchard.

In the introduction of the oriental fruit moth parasite *M. ancylivora* Roh., reported upon by J. S. Houser, a total of 6,156 individuals reared in New Jersey were liberated in orchards in Ohio and appeared to have become established. In later collections a parasitism of 49.7 per cent of all species occurred, of which 75.5 per cent was due to *M. ancylivora*.

[**Work with insect pests at the South Carolina Station**] (*South Carolina Sta. Rpt. 1930, pp. 59–74, figs. 6*).—In referring to the occurrence of insects in 1930 it is reported that at the Pee Dee Substation an undetermined coleopterous tassel borer was quite active, one field of corn having shown an infestation of 74 per cent. This borer is thought, however, to cause but slight actual damage.

According to C. O. Eddy much damage was done to seedling cotton throughout the major portion of the State in the growing season of 1930 by the onion thrips, an account of which has been noted (E. S. R., 64, p. 53), and *Frankliniella fusca* Hinds, which caused similar injury.

That the loss to the Elberta peach crop in 1930 caused by the oriental fruit moth, a circular relating to which has been noted (E. S. R., 62, p. 855), was only a fraction of that of the preceding year is considered by Eddy and W. C. Nettles to have been due in part to continued cold weather which occurred during the early part of the usual period of the moth's activity. The first eggs of the year that produced larvae which hibernated were laid on August 16; the last eggs producing larvae which hibernated were laid on October 12 and hatched on October 19 at the time of the first frost of the season. The parasite *Macrocentrus ancylivora* was introduced, a total of 9,062 individuals received from New Jersey having been liberated in orchards in the State. In experiments during the year burlap and similar bands applied to trees maturing fruit later than the Elberta variety caught large numbers of oriental fruit moth larvae, these bands being removed from the trees weekly and the larvae destroyed.

Eddy reports that additional territory was added to the area infested by the Mexican bean beetle, all but the four counties of Charleston, Beaufort, Jasper, and Hampton having now been invaded.

The corn variety plats at Florence are reported by O. L. Cartwright to have been entered to the extent of 99 per cent, 87 per cent having been injured by the corn ear worm. Data on shuck length and insect infestation in corn varieties during the years 1929 and 1930 are reported in tabular form. The average shuck length beyond the tip of the ear showed an increase over that produced the preceding year in all except two varieties. Data on corn resistance to rice weevils, also on weevil control in seed corn, are presented in tabular form.

A second generation of the corn billbug (*Calendra callosus*) is described by Cartwright.

Studies by Cartwright of the life history of the southern cornstalk borer again revealed three general emergence periods for the year (E. S. R., 62, p. 650), the first occurring between May 8 and June 24, the second from June 22 to August 31, and the third from August 4 to September 20. The single individual of the fourth emerged on September 27. In studying the relationship between yield and infestation, 46 per cent of the borers were found in the stems below the ground surface and 54 per cent in stalks above the ground surface, indicating the possibility of controlling at least a large portion of the borer population through destruction of all stalks immediately after harvest. The data show the relationship between infestation and yield to be about the same as that of the preceding year, or 82.88 per cent loss in infested stalks. It was

found in observations at Florence that borers overwinter equally as well in stubble plowed out on the ground surface as in stubble in natural position. Several natural enemies of the stalk borer were found during the year, of which the ants *Pheidole vinlandica* and *Ponera trigona opacior* were eating the pupae. The nematode *Diplogaster aerivora* was observed to kill a borer larva.

[Report of work in entomology at the South Dakota Station] (*South Dakota Sta. Rpt. 1930, pp. 21–23*).—In further work with a mixture of paraffin and paradichlorobenzene used against the plum tree borer (*Synanthedon pictipes* G. & R.) (E. S. R., 63, p. 50), its value as an effective control measure was demonstrated.

Brief reference is made to the progress of work with grasshoppers of the subfamily Crytacanthacrinae occurring in South Dakota, of which 36 species are now represented in the station collection. During the year only 4 species promised to become excessively abundant, namely, the red-legged grasshopper, the differential grasshopper, the two-striped grasshopper, and *Melanoplus mexicanus mexicanus* (Sauss.). It was found that the number of egg masses deposited is dependent largely upon the prevailing temperature, 75° F. or more favoring egg production and oviposition and a lower temperature being unfavorable.

Brief mention is made of observations of the pollinating agents of sweetclover in the State, with particular reference to seed production as influenced by the honeybee.

[Report of the division of entomology of the Washington Station] (*Washington Col. Sta. Bul. 245 (1930), pp. 30–34*).—A brief reference is first made to work with the potato flea beetle, accounts of which, by Webster and Baker, have been noted (E. S. R., 53, pp. 161, 251).

An account of oil sprays by A. Spuler includes data that have been noted in part from another source (E. S. R., 63, p. 460). Oils ranging in viscosity from 100 to 255 seconds Saybolt have been found satisfactory for dormant use. Emulsifiers have an important bearing on the phytocidal properties of the oil. The so-called quick breaking emulsions break immediately after application to the tree and leave a heavy oil deposit on the sprayed tree, the thickness of the oil film depending largely on the length of time the spray has been applied. Tests of various oil emulsions showed the oil content in the run-off to vary from 26 to 74 per cent. The more stable the emulsion the higher the oil content in the run-off. The oil deposit has a direct bearing on plant injury if the oil is applied after the buds first begin to break. Refinement of the oil is less important, since oils ranging in sulfonation test from 50 to 85 have given good results when applied during the dormant season. A 4 per cent oil emulsion was found to be necessary to control San Jose scale. This spray also is effective in destroying a high percentage of red spider eggs (European red mite and clover mite). Aphids are best controlled if the oil spray is delayed until the bud tips show green, but a spray at this time is not advisable because of possible injury to trees. Oil sprays used alone were ineffective in controlling the codling moth, although they killed from 80 to 95 per cent of the codling moth eggs actually hit by the spray. Oils having a viscosity range of 60 to 75 have given best results in the Wenatchee Valley.

An account of the codling moth by Spuler includes data on control work in the Wenatchee Valley, information relating to which has been noted from another source (E. S. R., 64, p. 460).

[Report of the department of entomology], A. J. HANSON (*Western Washington Sta. Bul. 18–W (1930), pp. 9–12, pl. 1*).—Reference is first made to an

Eriophyes mite which has become a pest of Evergreen blackberries in the Puyallup Valley, the loss caused by it having been estimated by individual growers at from 10 to 90 per cent. Its attack causes the blackberries to remain red throughout the season, the affection being known as "redberry disease." This injury was reported by Essig in 1925 as occurring in California (E. S. R., 54, p. 559).

In an examination made of 148 individuals of the two species of slugs (*Agriolimax agrestis* and *Prophysaon andersoni*) which serve as intermediate hosts of the microscopic tapeworm of chickens, the cysticercoid stage was found present in 16.

In control work with the potato flea beetle the use of Bordeaux mixture as a repellent gave almost no control in the experimental plat.

Mention is made of the Lecanium scale, now a serious pest of both shade and orchard trees, and of the forest tent caterpillar and the western tent caterpiller as two important tree defoliators.

[Report of control work with cranberry insects], D. J. Crowley (*Washington Col. Sta. Bul. 245 (1930), pp. 65–68*).—In control work in which oils of a viscosity of from 100 to 140 were applied at strengths of from 2.5 to 4 per cent, good control of the oyster shell and Putnam scales was obtained when sufficient spray was applied to reach infested stems, but nearly all the fruit buds were killed by the dormant oil sprays. A 3 per cent oil applied at the rate of 500 gal. per acre caused no injury, but the same oil applied at the same strength caused serious injury when 800 gal. per acre were applied. This oil spray injury was noticeable only late in the summer. It appears that dormant oil sprays can not be safely used for scale control on heavy cranberry vines, as apparently the oil film builds up to the point where it is toxic to the plant by the time that enough spray is applied to reach the scale infested stems. The percentage kill of the fireworm eggs in the plats sprayed with the dormant oil was beween 50 and 60.

Eleven different oils were used either in combination with nicotine sulfate, free nicotine, or pyrethrum, those with a viscosity of 65 giving uniformly good results. Their ovicidal value was greater than lighter oils, and there was no injury to the crop when not more than two oil sprays were applied in succession. When heavier oils were used some injury resulted. Two oil sprays can be safely applied prior to blossoming. These should be in combination with nicotine sulfate, free nicotine, pyrethrum extracts, or with lead arsenate. The lead-oil combination, however, is not nearly as effective as the others for controlling the cranberry fireworm. A higher percentage kill of both the oyster shell and Putnam scale in the crawler stage was obtained with the pyrethrum-oil combination than with the nicotine-oil spray. Nicotine sulfate with soap or oil was found more effective than pyrethrum when used against the black-headed fireworm after the fireworms become webbed up in the leaves. Many of the fireworm larvae can be killed by a 1 to 400 nicotine spray even in the webbed condition, provided the temperature is 70° F. or higher. Most of the first brood sprays, however, are applied when the temperature is 60° or under, and at that temperature pyrethrum sprays are more satisfactory than the nicotine. No variation in the efficiency of the pyrethrum has been noted because of high or low temperatures. It apparently kills entirely by contact.

Penetrol, a sulfonated oxidized petroleum product, was tested both in the laboratory and in the field on most of the cranberry insect pests. It was found that combined with nicotine it can be used at the rate of 1 to 1,000 for the black-headed fireworm, and was also very satisfactory as a carrier

for pyrethrum insecticides. Unfortunately, however, it can not be used for more than two sprays in succession, for, like oil sprays, it causes injury. For the first two sprays it can be used to advantage at the rate of 3 pints to 100 gal. of water, with either nicotine sulfate, free nicotine, or pyrethrum. Penethrum, a combination of pyrethrum and Penetrol, was found to be effective against the fireworm at a dilution of 1 to 300 gal. of water. It should be used only in the early part of the season, however.

Evergreen, an alcoholic extract of pyrethrum used in field tests throughout the season, was found to be a safe spray at all stages of the crop. Occasionally a late hatch of fireworm makes it necessary to apply a spray when the crop is in full bloom at which time it is the safest spray to use, since in field tests it causes less injury than any of the others.

Imazu, another pyrethrum spray, gave good results when used at the rate of 1 lb. to 50 gal. of water, and the tests show that it can be safely used at all stages of the crop. Uenothron, a highly concentrated pyrethrum soap, was found effective against the fireworm applied at the rate of 1 gal. to 800 gal. of water.

Two Derris extracts, Neoton and rotenone, were tested, the former proving to be no more effective than the less expensive pyrethrum sprays, while the latter tried against the fireworm and fruit worm at the rate of 3 oz. to 100 gal. of water killed the larvae of both and acted as a repellent to chewing insects for several days after the application.

Potassium fluo-aluminate, applied against the fruit worm in a small test plat, gave sufficiently encouraging results to justify testing it on a larger scale.

Mention is made of work with the fruit worm, for which lures and baits of many kinds were found unattractive. A Frost insect electrocuter with a light and volatile oil bait attracted large numbers of fireworms but only one or two fruit worms in the course of a 3-weeks test.

In parasitic control work in which a shipment of 25,000 individuals of the egg parasite *Trichogramma minutum* Riley were received from a commercial laboratory in California, encouraging results were obtained. Fruit worm injury was much lighter than during the two preceding years, only one bog having a serious infestation.

Boll weevil and plant lice poisoning work, H. F. Wallace (*Mississippi Sta. Rpt. 1930, p. 42*).—In comparative tests made at the Raymond Substation on four insecticide and two control plats of ½ acre each a net profit of $16 per acre was obtained through the use of insecticides, the application of which on August 9 and 16 was not commenced until the infestation was 100 per cent. Two of the four plats received a mixture of 8 parts of calcium arsenate and 1 part of nicotine-sulfate-arsenate at the rate of 14 lbs. per application, the others being treated with a mixture of 2 parts of calcium arsenate to 1 part of tobacco dust at the rate of 14 lbs. per application.

[Studies of the Mexican cotton boll weevil], F. F. Bondy (*South Carolina Sta. Rpt. 1930, pp. 113–115*).—In hibernation work with the boll weevil at the Pee Dee Substation a total of 22,000 were placed in 52 cages between September 1 and November 17, 1929. Of these 4.8 per cent emerged during the season of 1930, as compared with 14.2 per cent which survived in 1929. The first weevil emerged from hibernation on March 1 and the last on July 8. Of the 1,062 weevils emerging from the cages, 65.4 per cent did so prior to May 1, 91.9 per cent prior to June 1, 99.9 per cent prior to July 1, and 100 per cent by July 8. Of 5,000 weevils placed in hibernation cages between September 1 and 29, 118 or 2.4 per cent survived; of 2,000 weevils placed in cages between October 1 and 15, 97 or 4.9 per cent survived; of 2,000 placed in hibernation

between October 16 and 27, 156 or 7.8 per cent survived; and of the 3,000 placed in hibernation between November 1 and 17, 202 or 6.7 per cent survived.

A brief account is given of the weevil activity in cotton fields, in which work the station cooperated with the U. S. D. A. Bureau of Entomology. Seventeen insecticide tests were completed during the year, several having been conducted with a view to determining the value of the late summer applications of calcium arsenate dust.

Cotton-boll weevil control test (*Georgia Coastal Plain Sta. Bul. 12 (1930), pp. 17, 18*).—In boll weevil control work in the latitude of Tifton, where boll weevil emergence occurs largely before the cotton squares are formed, presquare or early poisoning has been found to pay substantial profits. During dry seasons the weevil can be held in check without much expense, but with extended periods of rainy or cloudy weather in the growing season control is difficult. The work thus far has led to the general recommendation of two or three applications of a homemade sirup mixture (2 lbs. of calcium arsenate, 1 gal. of sirup or molasses, and 1 gal of water) during the 15-day period preceding the appearance of the squares. If it should be necessary to make later applications on fruiting cotton, it is recommended that calcium arsenate be applied with a good dusting machine until the weevils are under control.

Chemistry of oil sprays, E. L. Green and J. R. Neller (*Washington Col. Sta. Bul. 245 (1930), p. 23*).—The authors found that the amount of ammonia ordinarily used in casein ammonia emulsifier was in excess of the amount necessary (E. S. R., 63, p. 250).

ANIMAL PRODUCTION

[Animal nutrition studies] (*New York Cornell Sta. Rpt. 1930, pp. 31, 32*).—These studies are in continuation of those previously noted (E. S. R., 62, p. 760).

The influence of undigested residues upon the growth and the well-being of the animal body.—In this study growing rats have been fed rations containing various levels of pure cellulose. When fed at a 10 per cent or higher level, cellulose retarded growth but did not influence the final body weight attained. Rats have been maintained in good health over the normal life period on high cellulose rations.

The specific effect of certain meats upon growth and fat deposition.—Rats fed a ration in which liver furnished part or all of the protein made optimum growth. Synthetic diets have produced similar growth as measured by body weight, but the testis failed to attain normal growth on purified diets.

Phosphatic limestone as a mineral feed.—When fed phosphatic limestone at a 1.34 per cent level, rats to a mild degree showed the teeth changes associated with excessive fluorine intake, but at a 5 per cent level normal bone development resulted. When fed at a 3 per cent level rats reproduced and lactated normally through 5 lactations. Pigs fed 3 per cent of phosphatic limestone developed normal bone ash content over a 4-months growing period and showed no harmful effect from the fluorine ingested.

[Nutrition studies of the Washington Station], J. Sotola (*Washington Col. Sta. Bul. 245 (1930), pp. 21, 22*).—The results of three studies are noted.

The biological value of the proteins of alfalfa leaves and stems and the digestion coefficients of nutrients in stems and leaves.—The biological value of first-cutting alfalfa hay was determined by feeding rations in the following order: (1) Nearly nitrogen-free rations, (2) alfalfa stems, (3) whole alfalfa hay, (4) alfalfa leaves, and (5) nearly nitrogen-free rations. The alfalfa hay,

leaves, and stems contained 12.19, 13.43, and 11.84 per cent of moisture; 11.67, 17.61, and 8.41 per cent of protein; 6.25, 8.98, and 4.73 per cent of ash; 1.42, 2.42, and 1.03 per cent of fat; 33.7, 17.32, and 41.34 per cent of crude fiber; and 34.77, 40.24, and 32.05 per cent of nitrogen-free extract, respectively. The studies showed that the coefficients of digestibility of the respective feeds were 52.8, 61.3, and 44.3 per cent of the dry matter; 65.2, 74.8, and 50.7 per cent of the crude protein; 43.3, 55.5, and 35.2 per cent of the fiber; 65, 71.8, and 55.8 per cent of the nitrogen-free extract; and 14.4, 16, and 58.3 per cent of the fat. The nutritive ratio of the whole hay was 1 : 4.95, of the leaves 1 : 2.99, and of the stems 1 : 8. By applying the coefficients of digestibility, it was found that the whole hay contained 45.25, the leaves 52.25, and the stems 38.38 lbs. of total digestible nutrients per 100 lbs. of feed. The biological value of the proteins in the whole hay and leaves was approximately the same, but the proteins had a somewhat higher value in the stems.

The study of the nutritive value of apple pomace.—Digestion trials with sheep showed that 46 per cent of the dry matter, 47 per cent of the crude fiber, and 62 per cent of the nitrogen-free extract of apple pomace was digestible. Fecal nitrogen in almost every case exceeded the nitrogn intake, and practically every animal was in a negative nitrogen balance. The seeds in the apple pomace were rather high in protein and fat as compared with the pomace itself.

The effect of plant maturity on the biological value of alfalfa proteins.—No difference was found in the biological values of the proteins of alfalfa plants cut when 12 in. high and those in the half- and full-bloom stages.

Commercial feeds in Kentucky in 1929, J. D. Turner, H. D. Spears, W. G. Terrell, and L. V. Amburgey (*Kentucky Sta. Bul. 310 (1930), pp. 509–546*).—This bulletin contains a summary of the results of the inspection and analysis of feeds sold in Kentucky during 1929, grouped according to class. The manufacturer's name, kind of feed, and the number of samples equal to or below their guaranty are given (E. S. R., 62, p. 360).

Sex and age as factors in cattle feeding, H. J. Gramlich and R. R. Thalman (*Nebraska Sta. Bul. 252 (1930), pp. 55, figs. 15*).—In this study 2-year-old steers, yearling steers, and steer calves were compared with spayed heifers of similar ages, and in addition yearling steers and steer calves were compared with open heifers of similar ages. The study was also designed to determine the influence of age and sex on the quality and quantity of beef produced. Shelled corn and alfalfa hay were selected as the ration to feed to all lots, except in some tests with steer and heifer calves when cottonseed cake was added.

In all tests the steers made larger and more economical gains than the spayed heifers. The steer calves made larger and less costly gains than the open heifer calves, but the yearling open heifers made slightly greater and more economical gains than the yearling steers. Open heifers were faster and more economical gainers than spayed heifers in all cases. Both open and spayed heifers fattened faster than steers, and for this reason the feeding period for 2-year-old and yearling heifers could be from 50 to 75 days shorter than for steers of similar ages, while heifer calves should be fed for from 25 to 50 days less than steer calves.

There was little difference in the dressing percentage of 2-year-old and yearling steers and heifers, but both spayed and open heifer calves dressed considerably higher than steer calves. The carcasses of both 2-year-old steers and heifers carried too much fat for the retail trade, but produced fancy ribs and loins for hotel and restaurant trade. However, the heifer carcasses were criticized for being too wasty.

The steers and heifers of all ages produced carcasses that were well marbled, of good color, and desirable size, except the steer calves which graded medium to good because of lack of finish. Steers of all ages cut a smaller percentage of hind quarter than heifers of similar ages, and the percentage of fore quarters of 2-year-old steers was greater than for calves. In all cases the steers had heavier rounds and lighter loins than heifers. Discrimination against heifer carcasses was justified only from the standpoint of wastiness. The open heifer calves produced the most desirable carcasses in this test.

Calves of both sexes were found to produce the best carcasses from the standpoint of economy of gain and desirability of carcass. The largest gains were made by 2-year-olds during the first 100 days and by calves during the last 100 days of the feeding period, while the yearlings made quite uniform gains throughout the test. For the entire feeding period, 2-year-olds made the greatest gains, followed in descending order by yearlings and calves, but economy of gain was in the reverse order. Calves could be handled on a narrower margin than other ages of cattle and produced carcasses of popular type that cut without waste.

Nitrogen top-dressing of bluegrass grazed by beef cattle, II, P. Gerlaugh, R. M. Salter, and F. A. Welton (*Ohio Sta. Bul. 470 (1931), pp. 153–155*).—In this test 3 lots of 5 dry, unbred cows and 5 yearling heifers each were turned on pasture on May 6, but at the conclusion of the study there were only 9 head of animals in each lot. The pasture for lot 1, consisting of 10 acres, was top-dressed with nitrogenous fertilizers; that for lot 2, 10 acres, was fertilized, and the animals rotated every 10 days; and that for lot 3, 20 acres, was untreated. The total gains in the respective lots were 2,095, 2,515, and 2,065 lbs. The cattle days per acre per season were 101, 127, and 60 on the respective pastures. The yield of dry matter per acre was 2,030, 2,237, and 1,315 lbs., and the crude protein content of the dry matter was 19.2, 19.7, and 15.8 per cent in the respective lots.

Flax straw for cattle (*South Dakota Sta. Rpt. 1930, p. 12*).—In a test of 4 lots of cattle, consisting of 3 head of steers and 3 head of cows each, fed rations containing flax straw plus a limited grain ration, there were no indications that good flax straw caused balls to form in the stomach or calves to be born prematurely.

A comparison of normal corn silage with grainless corn silage for finishing beef cattle, M. Jacob and H. R. Duncan (*Tennessee Sta. Bul. 144 (1930), pp. 22, figs. 6*).—This study covered three feeding periods, using two lots of about 20 steers each for each test. After a preliminary feeding period the two lots were started on a ration of either normal or grainless silage and cottonseed meal. The silage was fed according to the lot having the poorest appetite, and the cottonseed meal was gradually increased from an average of from 4 to 7 lbs. per day. A small amount of dry roughage, either hay or corn stover, was fed after the morning's feed was cleaned up.

On the average steers fed grainless silage gained 75.9 per cent as fast as those fed normal silage. Normal corn silage at an average cost of approximately $8 per ton produced 100 lbs. of gain as economically as grainless silage at $4 per ton. The steers receiving normal silage were worth $1 more per hundredweight than those on grainless silage, due to their better finish. When feeder steers were worth $9 per hundredweight and allowing margins on finished steers of $2.66 for those fed normal silage and $1.66 for those fed grainless silage, the average value during the last 2 years of the test for normal silage was $10.85 per ton and for grainless silage $3.87 per ton. Under the same conditions the grain in the normal silage was worth $1.05 per bushel.

Removing ears in the field reduced the yield of silage about one-third. The value of the pulled corn was reduced from 15 to 40 cts. per bushel, depending upon such conditions as stage of maturity, weathering, and heating.

[**Sheep experiments**] (*New York Cornell Sta. Rpt. 1930, pp. 32, 33*).—The result of two studies are noted.

Ram lambs as compared with wether lambs.—There was little difference in the gains of ram and wether lambs up until about the first of October, any advantage lying with the ram lambs. After that date the gains and carcass grades were increasingly in favor of the wethers.

The relation of feeding and management to "stiff lamb" trouble.—Post-mortem examination of lambs dying of "stiff lamb" trouble showed whitish areas in the muscles. In mild cases certain muscles were streaked with whitish lines, and in severe cases parts or all of some muscles were whitish in color and greatly changed in appearance. No cause for this trouble has been discovered. To produce the condition experimentally, two lots of 18 ewes each were fed during the winter and spring. One lot was fed a ration of mixed hay, corn silage, and a moderate allowance of grain and given all the outdoor exercise the weather permitted. The lambs in this lot were fed grain and hay in creeps. The second lot received such a liberal allowance of a high-protein grain ration plus all the alfalfa hay they would consume that the ewes became fat. This lot was confined in pens from November to April, and the lambs were not creep-fed. Three lambs in the second lot became "stiff," and on post-mortem examination showed the typical muscular lesions. No other lambs showing the slightest indication of lameness had any lesions upon post-mortem examination.

[**Sheep experiments**] (*Ohio Sta. Bul. 470 (1931), pp. 161–164, 165–168, figs. 3*).—The results of several experiments, some of which have been continued (E. S. R., 63, p. 59), are noted.

Wool production: A comparison of Ohio Delaine Merinos and Tasmanian Merinos, D. S. Bell.—Samples of wool from the sides of 10 Tasmanian and 10 Ohio Merino ewes and from their female offspring of the 1928 and 1929 lambing seasons, sheared in 1928, 1929, and 1930, were studied to determine the percentages of moisture, grease, dirt, and clean wool, and the average length of fleece unstretched, the average weight of fleece, and the percentage of clean wool to body weight. The Tasmanian Merinos had an advantage of slightly less than 0.5 in. in length of unstretched wool fibers. The Ohio Merinos sheared from 3 to 5.8 lbs. more grease wool per year, and the proportion of clean wool was approximately the same. The percentage of clean wool to body weight was in favor of the Tasmanian Merinos, due to the fact that they were smaller sheep. These ewes also averaged approximately one-third more fibers per square inch of body surface than the Ohio Merinos.

Timothy hay for wintering ewes, D. S. Bell, L. E. Thatcher, and C. H. Hunt.—From December 10 to April 15 four lots of 18 Delaine Merino ewes each were fed a grain mixture, and in addition the respective lots received clover hay, early-cut timothy hay, late-cut timothy hay, and ordinary-cut timothy plus 0.25 lb. of linseed cake per head daily. The grain was fed at the same rate in all lots, but the ewes were allowed all the hay they would consume. The early-cut timothy was superior to late-cut timothy, but not equal to clover hay. The ewes in lot 3 lost in weight, became thin and weak, yeaned weak lambs, milked poorly, and showed a decided tendency to shed their fleeces. Of the 16 lambs born to 15 ewes in this lot, only 12 were alive on April 15, and these weighed 1 lb. less at birth and gained 31 per cent slower than the lambs in lot 1. In lot 2, 20 lambs were yeaned but only 17 survived, while in lot 1 20 lambs were yeaned and raised. The ewes in lot 1 ate 68 and 78 lbs. more hay

per head during the test than the ewes in lots 2 and 3, respectively. On the basis of winter feed costs and pounds of lamb raised, the clover and early-cut timothy hay were of equal value, and on the same basis the early-cut timothy was approximately twice as valuable as the late-cut timothy. The lambs from the ewes fed timothy hay showed a depraved appetite by eating the wool from the flanks and hocks of their dams. Adding the linseed cake to the timothy hay made it nearly equal to early-cut timothy, but increased the cost of the ration and did not eliminate the depraved appetite of the lambs.

Lamb feeding, D. S. Bell.—In a study of the use of self-feeders for lambs, the mortality was so high that the study resolved itself into one dealing with the causes of death in fattening lambs. The total mortality was 29 out of 210 lambs, and all but 4 of the deaths occurred in the self-fed lots. The first difficulties were experienced after the lambs had been filled with clover hay and then allowed access to grain in self-feeders. The feeders were then discontinued, and the lambs were brought to a full feed by hand and again allowed free access to grain. After 6 weeks on the self-feeders a heavy death loss was sustained. The deaths occurred without apparent symptoms. Examination of the dead lambs showed nothing significant, but it was evident that most deaths took place when the proportion of the roughage to concentrates decreased, and it is thought that the heavy grain intake was at least one of the factors involved.

Rations for lambs (*South Dakota Sta. Rpt. 1930, pp. 13, 14*).—In this study it was found that for fattening lambs cottonseed meal and linseed meal were about equal in feeding value. The addition of either supplement to a dry pulp ration decreased the cost of gain and produced a better finish. The dry pulp was approximately equal to barley when fed without a concentrate, and had a somewhat higher feeding value when supplemented with either cottonseed meal or linseed meal. The dry pulp produced larger gains than pressed pulp when fed either with or without supplement. Cottonseed meal and linseed meal had a higher feeding value when used in pulp rations than when fed with either barley or corn. Pressed pulp supplemented with either cottonseed meal or linseed meal could be used to advantage during the first half of the feeding period and the lambs finished on barley or corn.

Studies of wool growth (*Washington Col. Sta. Bul. 245 (1930), p. 21*).—H. Hackedorn and J. Sotola, in cooperation with the Bureau of Animal Industry, U. S. D. A., found that wethers sheared regularly had a slightly smaller total wool growth than wethers carrying 5-year fleeces (E. S. R., 63, p. 263). There was a gradually decreasing rate of wool growth each year for both the sheared and unsheared wethers. The fleece of one unsheared wether weighed 76 lbs. and had a staple length of 13.5 in.

[Experiments with swine], A. E. Tomhave (*Delaware Sta. Bul. 167 (1930), pp. 16, 17*).—These studies have been continued (E. S. R., 62, p. 763).

Protein supplements for pigs.—In this phase of the study, 3 lots of 10 pigs each were fed for 91 days on rape pasture. All lots received shelled corn, and in addition the respective lots received cracked soybeans, ground soybeans, and tankage. The average daily gains in the respective lots were 1.19, 1.06, and 1.1 lbs. per head, and the feed requirements per 100 lbs. of gain were 391.71, 419.19, and 407.12 lbs., respectively.

A lot of pigs fed shelled corn and a protein supplement composed of tankage, linseed meal, and alfalfa leaf meal gained at the rate of 1.35 lbs. per head daily, while a similar lot in which ground soybeans were substituted for the linseed meal gained only 0.91 lb. The pigs receiving the soybeans required 90 lbs. more feed per 100 lbs. of gain than the other lot.

Forage crops for swine in Delaware.—Pigs on soybean forage made slightly larger gains and required less feed per unit of gain than pigs on rape forage, but the differences were not significant.

[Swine experiments] (*Ohio Sta. Bul. 470 (1931), pp. 168–176*).—Many of the following experiments, 11 of which are by W. L. Robison, are continuations of those previously noted (E. S. R., 63, p. 61).

Factors affecting the dressed yield of hogs.—In this study weight, condition, type, and fill were found to be factors influencing the dressing percentage of hogs. Thin hogs dressed out less than fat hogs of the same weight. A test with 40 hogs having an average back fat covering of 2 in. showed that they dressed approximately 1 per cent lower than 40 similar hogs having an average back fat of 2.4 in. Bacon hogs outdressed lard hogs of approximately the same weight by 1 per cent. The influence of fill was shown by the trucking of 40 hogs 56 miles to market. On the basis of live weight in the feed lot they dressed 74.7 per cent, on the basis of live weight on arrival at the packing plant 78.2 per cent, and on the basis of weight before slaughter the following morning 80.8 per cent.

Cottonseed meal for pigs.—In a lot of 10 pigs receiving ordinary cottonseed meal without alfalfa 7 pigs died, in a lot receiving the meal with alfalfa 6 died, and in a lot receiving cottonseed meal autoclaved for 1 hour at 14 lbs. pressure and alfalfa 1 died during the test. Checking against tankage alone and considering only the feed consumed per unit of gain, cottonseed meal made by a special process was worth $24.01, $27.76, and $3.46 more per ton than the above ordinary meals, respectively. The special meal also produced more rapid growth. Ordinary meal fed with tankage and making up 9.3 per cent of the ration caused no harmful effects, and this supplement was cheaper than tankage alone. The special meal was as economical as tankage when replacing part or all of it in the ration. The autoclaved meal was not injurious, even when it made up 21.2 per cent of the ration.

In further studies where alfalfa was not fed the special meal proved superior to the ordinary meal, both in feeding value and in effect on mortality. Using 1 lb. of ground oats for each pound of special meal, alfalfa, and minerals fed gave results comparable to results obtained when the trio mixture alone was fed. The combination of soybean oil meal and special cottonseed meal was not as efficient as the trio mixture.

Wheat for fattening hogs, H. W. Rogers.—Over a 30-day period in dry lot 29 pigs, averaging 119 lbs. per head, made an average daily gain of 2.16 lbs. each on a ration of ground wheat, tankage, clover meal, and salt, and required 298 lbs. of wheat, 30 lbs. each of tankage and clover meal, and 4 lbs. of salt to produce 100 lbs. of gain.

Protein feeds for pigs on pasture.—Tankage produced greated gains on rape pasture when fed as a supplement to corn and minerals than did a mixture of equal parts of tankage and cottonseed meal or tankage and linseed meal 2 : 1. Of the mixtures, the tankage and cottonseed meal proved to be superior.

Minerals for pigs on pasture.—A ration of corn and minerals proved superior to one of corn and salt, and, while not producing as rapid or as great gains per unit of feed consumed, was less costly than a ration of corn and tankage. Adding minerals to corn and tankage improved the ration only when the grain allowance was not limited.

Minerals for pigs in dry lot.—When a mineral mixture of salt, limestone, iron oxide, and potassium iodide was added to a ration of corn and trio mixture for pigs in dry lot at the rate of 1.6 per cent of the total ration, the pigs made slightly faster and more economical gains than those receiving the same ration with salt as the only mineral.

Kelp for pigs in dry lot.—A ration made up of corn and 0.2, 0.5, and 2.5 per cent, respectively, of salt, limestone, and kelp contained approximately 4.47 per cent of ash and had a calcium-phosphorus ratio of 1.49:1. The above ration, with the addition of haddock fish meal, was also fed to pigs in dry lot, and in both cases the kelp had a depressing effect. Pigs receiving kelp with the trio supplement gained 87.6 per cent as rapidly and required 7.4 per cent more feed per unit of gain than those receiving a ration of corn, trio mixture, and minerals. Pigs fed kelp, limestone, corn, fish meal, and salt gained 6.25 per cent less rapidly and consumed 4.9 per cent more feed per unit of gain than those fed the same ration without kelp.

Fish meal for the winter feeding of pigs.—Haddock and menhaden fish meals as protein supplements to a ration of corn and salt were compared with a ration of corn, trio mixture, and minerals. The pigs receiving the fish meals gained somewhat slower, but required 12 per cent less feed per unit of gain than those receiving the trio mixture. In this test there was little difference in the value of the two fish meals.

Ground oats as compared with whole oats and corn for pigs.—For feeding pigs indoors from approximately 65 to 210 lbs. in weight, grinding increased the value of oats 15.5 cts. per bushel when fed as the only grain and 29.9 cts. per bushel when fed with corn. In four tests ground oats as the sole grain proved to be 85 per cent as efficient as ground corn. When fed with corn at the rate of about 2 lbs. for each pound of protein and mineral supplement, ground oats were equal in feeding value to ground corn, pound for pound.

Hull-less oats for pigs.—When fed with corn, hull-less oats produced somewhat faster but less economical gains than did hulled oats. When checked against a ration containing corn as the only grain, the feed replaced by hull-less oats gave them a value of about 19.4 per cent more per pound than ground corn.

Quantity of feed for pigs on pasture.—In this test four lots of pigs were fed from a weight of about 73 lbs. to 200 lbs. on a ration of corn, tankage, and salt on clover pasture. The first lot received a limited ration throughout the test, the second lot was limited-fed to 125 lbs. live weight and then full-fed, the third lot was hand full-fed twice daily, and the fourth lot was self-fed. Average daily gains of 0.94, 1.22, 1.48, and 1.63 lbs. per head were made, and the feed consumed per 100 lbs. of gain was 345, 363, 379, and 376 lbs. in the respective lots. The return above feed and pasture cost was highest in lot 3, followed in descending order by lots 2, 4, and 1.

Forage crops for fattening pigs.—In this test alfalfa and rape ranked in the order named as forage crops for pigs and were superior to the other crops tried. Soybean pasture was palatable, but made no new growth after being grazed, the leaves dropped off as the plants matured, and the pasture did not have the carrying capacity of clover, alfalfa, or rape. Pigs did not relish sweetclover and failed to gain as rapidly or make as good use of their feed as those on rape pasture. Peruvian alfalfa winterkilled in Ohio, but pigs made more rapid and economical gains on it than on sweetclover. Sudan grass gave results comparable to those obtained with sweetclover.

The effect of continued feeding of sodium fluoride and rock phosphate on bone development and reproduction in swine, R. M. Bethke, C. H. Kick, and B. H. Edgington.—Feeding pigs either 30 or 60 gm. of sodium fluoride in each 100 lbs. of basal ration for 2 years caused a thickening of the shaft of the femur and lower jaw bones, and the teeth also were apparently affected. Replacing the limestone in the basal ration with 2 per cent of rock phosphate affected the bones and teeth in a similar manner. Sows farrowed apparently normal full-time pigs regardless of the amount of sodium fluoride or rock

phosphate fed, but with the latter mineral difficulty was experienced in getting sows to consume enough feed to nourish their young properly.

[Swine studies in South Carolina] (*South Carolina Sta. Rpt. 1930, pp. 35–38, 94, 117, figs. 2*).—The results of experiments, most of which have been continued (E. S. R., 62, p. 660), are noted.

A study of the influence of soybeans when fed with limited and full rations of corn and corn and tankage on the hardness of fat in hogs, E. G. Godbey.—In the fourth test of this series, hogs grazed on green soybeans from June 29 to August 24 were fed mature beans during the remainder of the fattening period. While on green beans the addition of tankage decreased the gain and increased the cost in both limited- and full-fed lots. Full feeding corn produced the most rapid gains, while limited feeding produced the most economical gains. Adding tankage to mature beans increased the rate of gain about 0.2 lb. per day in both limited- and full-fed lots and also increased slightly the cost of gain. For the entire period full feeding produced the most rapid and expensive gains, the addition of tankage increased the cost of gains in both limited- and full-fed lots, while the cheapest gains were made by pigs receiving a 2.5 per cent ration of corn and tankage. The average feed-saving value of an acre of beans was $13.15 higher for green than for mature beans. The highest return per acre was made when corn was full-fed on green bean pasture. The hogs on a limited ration of corn and soybeans killed soft and oily, half of those on a full feed of corn produced satisfactory carcasses, more than half of those receiving a full feed of corn and tankage were satisfactory, and all but one of the check lot killed hard.

Ground soybeans as a supplement to corn for fattening hogs in dry lot, E. G. Godbey.—Three lots of nine hogs each, averaging approximately 100 lbs. per head, were self-fed in dry lot on corn meal and the following supplements: Tankage, ground Biloxi soybeans, and ground Mammoth Yellow soybeans plus 2 per cent of additional protein furnished by fish meal. A mineral mixture was also self-fed in each lot. Lot 1 made the most rapid and economical gains, and lot 2 the slowest and least economical gains. Carcass studies showed that half of the hogs in lot 1 were medium hard and the others medium soft, while all the hogs in lots 2 and 3 were soft or medium soft. There was little difference in the dressing percentage, shrinkage, texture, tenderness, aroma, flavor, or fat of the carcasses in lots 1 and 2.

Protein supplements for fattening hogs in dry lot, E. G. Godbey.—Further comparisons of soybean meal, cottonseed meal, and peanut meal as protein supplements to a corn and fish meal ration for pigs in dry lot again showed the soybean meal to be slightly superior to cottonseed meal and the latter superior to peanut meal. When the fish meal was supplemented with either of the vegetable protein supplements, more rapid and economical gains were produced than when the fish meal was fed alone.

Hand v. *free-choice feeding on corn and fish meal*, E. G. Godbey.—Self-feeding free-choice a ration of corn and fish meal in dry lot produced more rapid and economical gains, while hand-feeding produced more rapid but expensive gains on barley forage. The use of forage increased the rate and decreased the cost with each method of feeding.

Green soybeans as a forage crop for hogs.—At the Coast Substation 12 pigs weighing slightly less than 60 lbs. each were fed from June 30 to September 17 a ration of corn, fish meal, and minerals free-choice, together with either Otootan or Biloxi soybeans. The average daily gains were 1.811 and 1.803 lbs. per head.

Hogging off corn.—At the Pee Dee Substation 59 pigs weighing 6,000 lbs. were turned on 10 acres of corn and soybeans. At the end of 43 days they weighed 10,052 lbs. The estimated yield of corn was 300 bu., giving a gain of 13.5 lbs. of pork per bushel of corn eaten.

[Experiments with swine] (*South Dakota Sta. Rpt. 1930, pp. 11, 12*).—The following studies have been continued (E. S. R., 63, p. 62).

How can soybeans be fed with corn to avoid soft pork?—Various combinations of corn, soybeans, and tankage were self-fed to 5 lots of pigs in dry lot. At a weight of 225 lbs., the pigs were killed and fat samples taken for analyses. When soybeans composed 12 per cent of the ration there was a fair rate of gain but soft pork was produced. When tankage was omitted, the ration was inadequate for proper growth and health. Omitting the soybeans increased the rate of gain and produced firm carcasses. Ground Manchu soybeans were very unpalatable.

Fattening fall pigs on South Dakota grains.—The difference in the rate and economy of gains of pigs fed a basal ration of tankage, alfalfa hay, and mineral mixture with either barley or corn was very slight. Ground proso did not prove to be as efficient as ground barley.

Pasture crops for spring pigs, W. E. Joseph (*Montana Sta. Bul. 236 (1930), pp. 31, figs. 9*).—Concluding this series of studies (E. S. R., 64, p. 256), it was found that when pigs were started on pasture and finished in dry lot the lowest feed requirement per 100 lbs. of gain was obtained on a ration of 1.5 lbs. of ground hull barley and 2 oz. of tankage per head daily on pasture and a mixture of 96 per cent of ground barley and 4 per cent of tankage self-fed in dry lot. The above method of feeding was also the most economical, though not the most rapid, while a ration of 1.5 lbs. of barley on pasture and barley self-fed in dry lot ranked second in economy. Starting pigs on pasture only and feeding barley alone in dry lot produced the most expensive gains. A ration of barley and tankage 96:4 self-fed during both pasture and finishing periods produced the most rapid gains, followed by a ration of barley self-fed during both periods.

These tests indicate that developing growing feeder pigs on pasture alone is an expensive method. This period of retarded growth resulted in a tendency for some pigs to put on a high finish at light weights, and the risk of loss when on pasture alone was somewhat greater than with other methods (E. S. R., 42, p. 66).

Pigs receiving grain or grain and tankage on pasture made more economical gains than pigs receiving the same concentrates in dry lot. Pigs on rape pasture required less feed per unit of gain than pigs on either alfalfa or clover pasture, but during the subsequent finishing period the pigs that had been on alfalfa pasture made the most economical gains. The combined results of the two periods favored the use of alfalfa pasture.

Barley alone was not as efficient either when fed on pasture or in dry lot as barley and tankage, and particularly was this true when no grain or limited grain was fed during the pasture period. Feeder pigs were produced at a lower cost per 100 lbs. of live weight when fed a limited grain or grain and tankage ration on alfalfa pasture than when fed on alfalfa pasture only.

The prevention of anemia in suckling pigs (*New York Cornell Sta. Rpt. 1930, pp. 34, 35*).—A group of 14 sows and their litters was confined in the farrowing house from farrowing time until the pigs were about 8 weeks old. After from 2 to 3 weeks of age, all pigs had access to a grain mixture in a self-feeder. The check lot received no additions to this ration, while a second lot was given a daily dose of a solution of ferric sulfate, a third group had

dried ferrous sulfate mixed in their grain at the rate of 0.1 lb. to 100 lbs. of feed, and in the fourth group the udders of the sows were painted daily with a concentrated solution of ferric phosphate. Blood samples were taken from each pig weekly, and hemoglobin determinations were made.

The pigs in the check lot became anemic at from 3 to 4 weeks of age, while none of the pigs in the other lots showed any symptoms of anemia and all made normal growth.

Proportion of grain to hay for the work horse (*New York Cornell Sta. Rpt. 1930, p. 33*).—One horse in each of five working teams was fed a ration consisting of about half grain and half hay, while its team mate received a ration in which 3 lbs. of grain was replaced with 4 lbs. of hay. There was no significant difference in the effectiveness of the rations, and both horses in each team lost weight.

Cottonseed meal for mules, E. G. GODBEY (*South Carolina Sta. Rpt. 1930, p. 38*).—Mules fed a ration of shelled corn and grass hay lost an average of 0.27 lb. per head daily, while a second lot in which 1 lb. of cottonseed meal (E. S. R., 62, p. 661) replaced 2 lbs. of shelled corn and fed at the rate of 0.75 lb. of meal per day lost 0.295 lb. per head daily. The use of cottonseed meal reduced the cost of feed slightly.

[Poultry experiments], A. E. TOMHAVE and C. W. MUMFORD (*Delaware Sta. Bul. 167 (1930), pp. 17–19*).—The results of several experiments, most of which have been continued (E. S. R., 62, p. 765), are noted.

Utilization of ground soybeans for poultry.—In this study 6 lots of 50 pullets were fed a ration to which was added protein supplement combinations of meat scrap, dried buttermilk, and ground soybeans. The percentage of ground soybeans in the respective rations was 0, 5.4, 10.5, 15.2, 1.4, and 16.9. In lot 5 ground soybeans replaced the dried buttermilk, and in lot 6 the meat scrap and dried buttermilk. The average number of eggs per bird in the respective lots was 147.1, 147.2, 113.1, 107.7, 133.9, and 110. Mortality was highest in lot 1, following in descending order by lots 3, 4, 5, 2, and 6. The feed required per dozen eggs produced was highest in lot 4, followed in descending order by lots 3, 6, 5, 1, and 2.

In a second phase of this project, 3 lots of chicks were fed the station all-mash growing ration for 10 weeks, after which the following amounts of ground soybeans were added: 0, 20.9, and 25.3 per cent, respectively. At the end of 20 weeks the pullets in lot 1 averaged 2.76 lbs. per head, those in lot 2, 2.61 lbs., and those in lot 3, 2.39 lbs. The mortality in the respective lots during the last 10 weeks was 2, 4, and 2.

Confinement of laying pullets without succulent green food.—Birds kept in confinement had about the same average egg production, were slightly heavier at the close of the experiment, and consumed somewhat less feed per dozen eggs produced than birds on range.

All-mash method of feeding pullets.—White Leghorn pullets fed by the all-mash method produced about as well as similar pullets fed scratch and mash. With a properly made-up ration no difficulty was experienced in getting birds to consume sufficient feed, and the method simplified feeding and did not permit birds to unbalance an otherwise balanced ration.

[Poultry experiments], G. R. SIPE (*Mississippi Sta. Rpt. 1930, pp. 31–33*).—Continuing the work previously noted (E. S. R., 64, p. 465), four experiments are reported.

Cottonseed meal as a total source of protein for broiler production.—Results obtained in the second year of this study again indicate that cottonseed meal

may be used in large amounts for feeding broilers when properly supplemented with minerals.

Effect of cottonseed meal on storage eggs.—In this test 4 lots of hens were fed rations containing 4, 10, 28, and 0 per cent of cottonseed meal, respectively. Cases of eggs from each lot were placed in storage on April 16. The eggs were candled on going into storage and at 60-day intervals until November 27, when they were removed. At the beginning the eggs were of uniform quality and in good condition, but at the end of the test the case from the lot receiving 28 per cent of cottonseed meal showed 70 seconds and 216 green yolks. The eggs from the lot receiving 10 per cent of meal showed 110 seconds and 74 green yolks, those from the 4 per cent meal 23 seconds and 1 green yolk, and those from the check lot 12 seconds and no green yolks. The limitations of cottonseed meal feeding for producing storage eggs appear to lie between 5 and 10 per cent.

A study of the value of charcoal for laying hens.—The results obtained in this year's study were closely comparable to those previously noted.

Combining standard type color and egg production in the same fowl.—The F_1 birds of the Rhode Island Red, Barred Rock, and White Leghorn breeds used in this stndy showed a marked improvement in egg production as compared with the records of their dams. The type and color of the offspring also showed an improvement over that of the parent stock.

[**Poultry studies at the New York Cornell Station**] (*New York Cornell Sta. Rpt. 1930, pp. 88, 89, 90, 91*).—The results of two studies are noted.

Poultry nutrition.—In a study of the seasonal variation of sunshine it was found that the antirachitic value of early summer noontime sunlight was about twice that of early spring noontime sunlight and eight times that of early winter noontime sunlight. Exposures of 5, 10, and 40 minutes, respectively, to these sunlights prevented the development of rickets in chicks and produced normal growth up to 12 days of age. Glazing materials which, after solarization, permitted transmission of 25 per cent of the available ultra-violet rays of sunlight at 302μ were satisfactory for exposing chicks to spring and summer sunlight, but were of doubtful value during the winter, due to the long exposure required.

When an optimum supply of the antirachitic factor was present, chicks required a minimum calcium allowance of approximately 0.66 per cent of the ration and a minimum phosphorus allowance of about 0.5 per cent of the ration. The optimum calcium allowance is probably between 1 and 1.2 per cent of the ration, while the phosphorus content of such rations can not be lowered below 0.8 to 0.9 per cent, due to the high phosphorus content of the commonly used feeds. The optimum calcium-phosphorus ratio appeared to be between 1:1 and 2:1.

Cod-liver oil, sunlight, and ultra-violet rays had similar effects on egg production, eggshell strength, hatchability, mortality, and percentage of ash in leg bones. In 3 experiments of approximately 48 weeks' duration, the average production of the control group was about 75 eggs with a breaking strength during the last 12 weeks of 4.2 lbs., while the groups receiving the above supplements averaged approximately 160 eggs with a breaking strength of about 8 lbs. In the control group hatchability was 35 per cent, mortality 32 per cent, and ash in leg bones 57 per cent, while in the other groups these factors were 60, 20, and 62 per cent, respectively.

The protein requirements for maximum early growth appeared to be about 20 per cent. At from 6 to 8 weeks of age the protein level may be reduced to from 17 to 18 per cent, and at from 12 to 14 weeks of age to from 15 to

16 per cent. No further reduction can be made during the growing period without impairing the normal development of pullets up to the time they begin to lay.

Marked improvement in egg production of the Cornell poultry flocks.—This is a progress report of a study which deals with the development of two contrasting high- and low-line flocks in an effort to discover the principles of inheritance. This project was started in 1909 and is still in progress.

[**Poultry studies**] (*Ohio Sta. Bul. 470 (1931), pp. 184–186, fig. 1*).—Several studies are briefly noted.

Observations on a type of paralysis in growing chicks, R. M. Bethke, P. R. Record, and D. C. Kennard.—A peculiar type of paralysis, characterized by the birds walking upon their hocks with the toes curled inward, was observed in a lot of chickens receiving a ration of yellow corn, wheat, wheat bran, fish meal, salt, and cod-liver oil. Some of the affected chicks recovered without change in ration or management. During the 8 weeks' test from 20 to 70 per cent of the birds were affected at some time or other. When meat scrap replaced the particular fish meal or when the latter was supplemented with 5 per cent or more of dried buttermilk, skim milk, or whey, or from 5 to 10 per cent of alfalfa leaf meal, no difficulty was experienced. Adding 5 per cent of autoclaved yeast or an Argentine casein prevented the disorder. Treating the birds with ultra-violet rays was without effect.

The relative antineuritic and antipellagric vitamin content of fresh eggs, R. M. Bethke and W. Wilder.—Studies with rats showed that whole fresh eggs contain approximately 75 per cent more of the antipellagric than the antineuritic vitamin. Attempts to increase the antipellagric content of the eggs by giving hens feeds high in this factor have given negative results.

The iodine content of eggs, R. M. Bethke and O. H. M. Wilder.—The iodine content of eggs was found to be dependent upon the quantity found in the ration. Feeding iodine in either an organic or inorganic form increased the iodine content of the eggs.

Nutritional factors affecting hatchability of eggs, R. M. Bethke, P. R. Record, and D. C. Kennard.—In order to produce a high percentage of hatchable eggs, it was found that the ration of the birds must contain a good quality legume hay or meal, or milk in some form (E. S. R., 63, p. 62). The beneficial factors of alfalfa leaf meal could be extracted with acidulated water. Autoclaved yeast fed at a 3 per cent level or a concentrated liquid prepared from milk after the removal of the proteins, fats, and part of the lactose and calcium phosphates had a beneficial effect on hatchability. Substituting a flame-dried menhaden fish meal for meat scrap did not improve hatchability, but adding 5 per cent of a good quality alfalfa leaf meal to the fish meal increased hatchability 100 per cent.

[**Poultry experiments**], C. L. Morgan (*South Carolina Sta. Rpt. 1930, pp. 90–93, fig. 1*).—These studies are continuations of those previously noted (E. S. R., 62, p. 661).

Effect of time of hatch on egg production of pullets.—Studies with White Leghorn pullets indicated that where lights are used during the winter months there is no significant relationship between hatching date and yearly egg production. Early fall and winter production was maintained at a high level by using lights and early-hatched pullets. Under average conditions White Leghorns and other light breeds should be hatched in April to obtain maximum winter production where no lights are used.

Comparison of cottonseed meal and meat scrap as sources of protein for poultry.—Birds receiving meat scrap as a protein supplement laid eggs which were 98 per cent fertile with a hatchability of 79.5 per cent, those receiving

a protein supplement of equal parts of meat scrap and cottonseed meal laid eggs that were 97.1 per cent fertile of which 66.1 per cent hatched, and birds receiving cottonseed meal plus a mineral mixture laid eggs that were 93.3 per cent fertile with a hatchability of 26.1 per cent. These results indicated that cottonseed meal contains a factor which causes the death of the chick embryo. There was no difference in the growth of chicks or the development of pullets from these lots when they were fed the same ration.

The value of cod-liver oil in rations for laying hens.—The author, cooperating with J. H. Mitchell and D. B. Roderick, found that White Leghorn pullets receiving no cod-liver oil produced 100.5 eggs per bird from November 1 to April 30, while a similar lot receiving cod-liver oil produced 99 eggs each. The average egg production of Barred Plymouth Rock pullets during the same period was 73.6 for those receiving no cod-liver oil and 82.9 for those receiving cod-liver oil. The percentage of fertile eggs in pens of White Leghorn pullets, Barred Plymouth Rock pullets, and White Leghorn hens receiving no cod-liver oil was 85.7, 74.3, and 98, and the percentage of hatchability was 68.8, 36.3, and 79.5, respectively. The corresponding percentages for similar lots receiving cod-liver oil were fertility 85.3, 85.9, and 95.2 and hatchability 51.1, 44.9, and 61.9, respectively.

A study of the eggshell texture of the pullet lots showed that the addition of cod-liver oil increased slightly the breaking strength of the shell. The magnesium carbonate content of the eggshell was not affected by cod-liver oil feeding.

Ground barley v. ground yellow corn in the laying mash.—The egg production of a lot of birds receiving ground barley as a substitute for ground yellow corn in the laying mash was practically the same as that of the check lot when the scratch grain consisted of a mixture of shelled yellow corn and whole wheat 2 : 1.

Fish meal v. meat scrap for laying hens.—One year's results indicate that on the basis of egg production fish meal is equal in value to meat scrap, but that there was a reduced hatchability following the use of fish meal.

Bone meal as a mineral supplement to laying mash.—The addition of bone meal to a laying mash containing 20 per cent of meat scrap has shown no advantage from the standpoint of egg production.

All-mash method of feeding laying hens.—No significant differences have been observed in lots of birds fed by the all-mash method or those self-fed mash and hand-fed grain.

[Poultry experiments] (*South Dakota Sta. Rpt. 1930, p. 30*).—Three experiments are briefly noted.

Comparison of high protein feeds.—A pen of laying hens receiving buttermilk powder and tankage as protein supplements produced the largest number of eggs, followed in descending order by lots receiving alfalfa meal, dried buttermilk, soybean meal, and the check ration.

Pen heating.—A pen of laying hens whose quarters were heated so that the temperature was above freezing at all times ate less feed and laid more eggs than a similar pen in unheated quarters. After deducting the cost of fuel and feed from the sale of the eggs, there was a balance of $3.54 over production cost in favor of the heated quarters. However, no deductions were made for labor.

Calcium carbonate carriers for eggshell formation.—Over a 6-months period a lot of Leghorn hens consumed 133 lbs. of oyster shell and produced 4,053 eggs, while during the same period a similar lot consumed 106 lbs. of a commercial limestone and produced 3,952 eggs.

[Poultry experiments at the Washington Station] (*Washington Col. Sta. Bul. 245 (1930), pp. 50, 51*).—The results of several experiments, most of which have been continued (E. S. R., 63, p. 264), are noted.

Methods of feeding Single Comb White Leghorn pullets, L. W. Cassel.—Four lots of White Leghorn pullets were fed the same ration by the following methods: Lot 1, unlimited dry mash and limited quantities of scratch grain in the litter; lot 2, unlimited dry mash and limited quantities of scratch grain in hoppers; lot 3, unlimited quantities of all mash; and lot 4, unlimited quantities of the ration compressed in pellet form. Cut alfalfa hay was fed throughout the test. Over a period of 12 months the respective lots produced an average of 237.7, 242.7, 218.3, and 221.4 eggs per bird. Lot 4 consumed 4.5 lbs. more feed per bird during the year than lot 3. Hopper-feeding scratch grain was more sanitary and produced as good results as feeding scratch grain in the litter.

Protein requirements for growing chicks, J. S. Carver, L. W. Cassel, and T. E. Aspinall.—Chicks on a ration containing 18.12 per cent of protein made more rapid growth during the first 6 weeks' feeding than a lot receiving 15.01 per cent of protein, and the same was true of the latter lot as compared with one receiving 11.9 per cent of protein. The advantage in growth was maintained to 28 weeks of age, when all lots weighed practically the same. The protein efficiency was practically the same in all lots, but the feed efficiency increased as the protein levels increased.

Synthetic rations, J. S. Carver and T. E. Aspinall.—In this study it was found that in order to have a satisfactory synthetic ration for chicks it was necessary to obtain one which would be consumed in considerable quantities and also a means for preventing leg weakness of unknown origin. Wheat germ oil fed at a 5 per cent level was inadequate for entirely preventing paralysis.

[Experiments with poultry], M. W. Miller and G. E. Bearse (*Western Washington Sta. Bul. 18–W (1930), pp. 23–25, 27–33*).—The results of several experiments are noted.

Rapidity of increase in pullet egg size.—A statistical study was made of 209 Single Comb White Leghorn pullets to determine whether the rate of increase in pullet egg size was an inherited character and, if so, to determine the mode of inheritance. It was found that the rate of production did not influence either average 90-day egg weight or egg size increase. The larger birds tended to have the higher first 10-day average egg weight. Late-maturing birds also tended to have a high first 10-day average egg weight, but the individual birds had a slight tendency to weigh less. The birds laying small eggs during the first 10 days had a decided tendency to increase their egg size faster than birds laying larger eggs during the same period.

Feeding excess protein to laying hens.—In this study 5 lots of 6 birds each received a ration of 70 lbs. of mash and 30 lbs. of protein concentrates. The concentrates used were fish meal, dry skim milk powder, dry horse meat, beef scrap, and "stick" (evaporated packing house tank water). A check pen received the same basal mash with only 15 per cent of protein supplement. The average percentage of production for 6 months in the check lot was 36.5, and in the protein supplement lots 51.3, 51.1, 37.1, 44, and 21.6, respectively. At the end of 6 months all living birds were killed and the condition of the internal organs noted. There were no mortalities in the fish meal and milk lots, and the only mortalities in the check and horse meat lots were due to cannibalism. Two birds in the beef scrap and one in the "stick" lot died of egg trouble, but another bird in the "stick" lot died of fatty infiltration of liver and kidneys. It is concluded that 30 per cent of pro-

tein concentrate in a ration did not produce a high percentage of organic trouble and did not prevent cannibalism.

Blowouts and pickouts in poultry.—Four lots of chicks were fed in this study. The check lot received a ration composed of corn, wheat, and oats plus protein concentrate, minerals, and vitamins. In the other lots the grain portion of the ration was composed solely of corn, wheat, and oats, respectively. The chicks receiving the oats made the best growth. Feather picking occurred in the corn lot, probably due to the fact that the feathers were of a creamy color, oily, and palatable. Practically no feather picking occurred in the other lots. Several pickouts occurred among the mature birds in the corn lot, due to the fact that these birds laid their eggs on the floor. One pickout occurred in the wheat and one in the oats lot. No cases of prolapse had occurred to date.

Clean egg nest trial.—In this study a 6 months' trial was conducted to compare three types of clean egg nests and straw nests for securing clean eggs. The results showed that the clean egg nests permitted more high-grade eggs to be marketed than the straw nests. The initial cost of the clean egg nests makes it a doubtful practice to replace straw nests, but in new houses a greater return on investment would be secured from clean egg nests than from straw nests.

Growth and development with special reference to domestic animals.—XVI, The influence of temperature and breeding upon the rate of growth of chick embryos, E. W. Henderson (*Missouri Sta. Research Bul. 149 (1930), pp. 47, figs. 18*).—In this study (E. S. R., 63, p. 760) from 150 to 200 eggs from Single Comb White Leghorn hens under uniform conditions of management were incubated at 96, 101.8, or 107° F. Humidity and ventilation were maintained as uniform as possible, and the eggs were turned twice daily. For the study of the influence of breed, eggs from Dark Cornish, White Leghorn, White Leghorn × Dark Cornish, and Dark Cornish × White Leghorns were incubated at 101.8°. The rate of growth was determined by extracting duplicate samples of from 4 to 6 embryos daily, beginning when the embryos had reached approximately the normal 96-hour stage.

The growth rate of the embryos was profoundly influenced by temperature as measured by the daily dry weight and nitrogen content and as indicated by temperature coefficients. The greatest influence was exerted during the earliest stages of growth, decreasing at successive stages and practically stopping when the embryo was about 16 days old or when it reached a dry weight of about 2 gm. The temperature limits for growth to a weighable size were from 34 to 42.2° C. (93.2 to 108° F.) at an average relative humidity of about 60 per cent. The temperature-regulating mechanism of the embryo began functioning at about 16 days.

That the growth rate was fairly constant through three or four stages was demonstrated at 38.8° C. The number and limits of these stages were dependent upon the measures used to determine growth. The usual limits of the stages were the fourth, sixth to eighth, sixteenth to seventeenth, and nineteenth to twenty-second day of age, with some indications that an increase in temperature shortened the stages and shifted the limits. As a rule, the limits coincided with the changes in the type of chemical compound used for energy.

Little or no significant difference existed in the growth rate of embryos from the different strains or breeds studied. The percentage mortality was approximately the same at both extremes of temperature. When the relative humidity was constant the loss of moisture of eggs increased slightly as the temperature increased.

Appended are a review of the literature and a bibliography.

DAIRY FARMING—DAIRYING

[**Experiments with dairy cattle**], J. S. MOORE (*Mississippi Sta. Rpt. 1930, pp. 17, 18*).—Three experiments are noted, in continuation of those previously reported (E. S. R., 64, p. 470).

Pasture v. dry feed for dairy cows.—The milk production of 3 cows fed in dry lot during periods 1 and 3 of 3 8-week periods and fed on pasture during the second period was 8,693 lbs. and the fat production 342.69 lbs. A second lot on pasture during the same period as the first lot was in dry lot produced 10,584 lbs. of milk and 414.29 lbs. of fat. A third lot on pasture continuously produced 9,480 lbs. of milk and 364.58 lbs. of fat. The feed cost per unit of production was considerably higher in the first lot than in the other two, for which the difference was not significant. The cows in lot 1 lost 5 lbs. during the test, while those in lot 2 gained 486 lbs. and those in lot 3, 331 lbs.

Corn and cob meal and sorghum silage v. ground sagrain seed and sagrain silage.—Cows on the sagrain ration produced 1.5 per cent more milk, while those on the corn and sorghum silage produced 3.1 per cent more butterfat during the course of the experiment. The cows receiving corn gained 86 lbs. in live weight, while those receiving sagrain gained only 6 lbs. The sagrain silage was not as palatable as the sorghum silage.

Weight of calves at birth as compared with weight of dams.—The average birth weight of 145 Jersey male calves and 165 female calves was 51.95 and 48.93 lbs., respectively. The average gestation period was 279.92 days for males and 279.21 days for females. The average birth weight of 50 Ayrshire male calves and 44 female calves was 71.52 and 67.16 lbs., respectively. The average gestation period was 281.45 days for males and 280.7 days for females.

[**Experiments with dairy cattle**] (*New York Cornell Sta. Rpt. 1930, pp. 28–31*).—The results of three experiments are given in this report, two of which are in continuation of those previously noted (E. S. R., 62, p. 766).

Proper amount of protein for dairy cows.—During the first 40 weeks of this test the cows on the 16 per cent protein grain mixture produced an average of 9,261 lbs. of milk and 280 lbs. of fat; those receiving 20 per cent of protein an average of 10,055 lbs. of milk and 329 lbs. of fat; and those on 24 per cent of protein 9,399 lbs. of milk and 286 lbs. of fat. The cows in the second lot produced more fat, but gained less in body weight than the other lots.

Dried skim milk as compared with dried skim milk and corn sugar in raising calves.—A group of calves was started on a limited amount of whole milk and gradually changed to reconstituted skim milk made by mixing 1 lb. of dried skim milk with 9 lbs. of water. A similar lot was started in the same way, but was changed to a liquid made by mixing 0.5 lb. of dried skim milk and 0.5 lb. of corn sugar with 9 lbs. of water. At the end of 6 months the average weight and the average height at withers were practically the same in both lots.

The influence of a low-fat ration upon milk secretion.—Repeating this test with grain rations having fat levels of 6 and 3 per cent again showed a lowered yield accompanying the lower fat intake, and there was also a change in the blood lipids. Determinations of total fatty acids, phospholipid fatty acids, and cholesterol at intervals showed that these constituents are higher during lactation than during the dry period, and that the levels during lactation tended to parallel the level of milk secretion. Similar results have been obtained with milch goats.

[**Dairy cattle experiments**] (*Ohio Sta. Bul. 470 (1931), pp. 136–150, figs. 4*).—The results of experiments, mainly in continuation of those previously noted (E. S. R., 63, p. 65), are reported.

Investigations regarding the level of protein feeding, A. E. Perkins.—The level of protein feeding had little influence on the composition of the milk produced except that the very low levels appeared to have a slightly depressing effect on the fat content. The nonprotein nitrogen of the milk was much greater in the milk of cows on a high-protein ration, and the same condition existed in the blood. The total nitrogen in the urine, total nitrogen occurring as urea, and the urea nitrogen in urine for cows on a ration with a nutritive ratio of 1:13 were 0.25, 12.5, and 0.03 per cent, for those on a normal ration 1.4, 65.9, and 0.92 per cent, and for those on a ration with a nutritive ratio of 1:2, 2.2, 80, and 1.76 per cent, respectively.

Processing dairy feeds, C. C. Hayden and C. F. Monroe.—In this test two lots of 16 cows each were fed by the reversal method through two periods of 70 days each. During one period the first lot received a mixture consisting of alfalfa hay 60 parts, corn stover 40, salt 1, and Kultogras (a proprietary substance for processing roughages) 3 parts. The other lot received the same mixture except that ground corn and oats were substituted for the Kultogras. On the basis of milk and fat production and fat production per 100 lbs. of dry matter fed, there was no benefit derived from the use of Kultogras, but there was a significant gain in live weight. Kultogras had a diastatic power which enabled it to change starch into invert sugar, but since the roughages fed contained no starch very little sugar was produced.

Comparison of legume hays, C. C. Hayden.—During their first loctation three groups of Holstein heifers were fed corn and either alfalfa, soybean, or clover hay. The average milk production was 7,017, 7,978, and 7,037 lbs., and the average fat production was 256, 305, and 274 lbs., respectively. Since these rations were deficient in phosphorus, one cow in the alfalfa group was fed steamed bone meal during her second lactation. She produced 8,188 lbs. of milk and 293 lbs. of butterfat, while a second cow receiving no bone meal produced 8,511 lbs. of milk and 284 lbs. of butterfat.

Manamar, C. F. Monroe and W. E. Krauss.—The height at withers and weight of the heifers in this study at 18 and 24 months of age are given in tabular form. No outstanding differences were found between the lots, but the averages indicate that the check heifers were slightly heavier, while the Manamar heifers were somewhat higher at the withers.

The food value of milk as affected by high and low protein rations, W. E. Krauss and C. C. Hayden.—Rats were fed rations in which the sole source of protein was skim milk powder made from the milk of groups of cows on varying protein levels. The gain per gram of protein intake in the lot fed the skim milk from the high-protein ration was 1.97 gm., in the lot fed the skim milk from the low-protein ration 2.12, and in the lot fed the skim milk from the normal ration 2 gm.

Supplementary value of manganese when added to milk, W. E. Krauss.—Since rats fed whole milk alone developed nutritional anemia, curative and prophylactic studies were conducted using manganese alone and in various combinations with iron and copper as a corrective. Since no beneficial effects were obtained, it is concluded that milk is not deficient in manganese in the same degree as it is in copper and iron.

The vitamin B and vitamin G content of milk, C. H. Hunt and W. E. Krauss.—No increase in the vitamin B or G content of the milk resulted from feeding cows 0.5 lb. of dried yeast daily.

Reproduction on exclusive milk diets, W. E. Krauss.—Third-generation rats have been produced on a ration of whole milk plus 0.5 mg. of iron and 0.16 mg. of copper per head daily.

Effect on the vitamin D content of milk of feeding irradiated ergosterol to cows, W. E. Krauss, C. F. Monroe, and R. M. Bethke.—No improvement was found in the vitamin D content of the butterfat of milk cows fed irradiated ergosterol at the rate of 5 or 10 mg. daily. However, when fed at a 25-mg. level there was a slight improvement, and when 100 mg. were fed there was a decided improvement in the vitamin D content of the butterfat. Using the "line test" procedure with rats, it was found that the vitamin D content increased in proportion to the number of rat units of vitamin D fed to the cows as irradiated ergosterol. At the 100-mg. level the vitamin D content was ten times greater than the vitamin D content before ergosterol feeding was begun.

Effect of iodized milk on growth of calves, W. E. Krauss and C. F. Monroe.—Two groups of calves were fed the same basal ration, but one group received normal whole milk while the other group received milk from cows getting 0.1 gm. of potassium iodide per head daily (E. S. R., 63, p. 668). Both lots received the same amount of milk over a 6-months period, and while the iodized milk did not stimulate growth the calves receiving it made better use of their feed, based on gain per 100 lbs. of milk and per pound of dry matter consumed.

Effect of pasture on vitamin A content of milk, W. E. Krauss.—Cows on pasture produced butterfat approximately twice as potent in vitamin A as the butterfat of the same cows before turning on pasture.

[**Dairy cattle experiments**], J. P. LaMaster and E. C. Elting (*South Carolina Sta. Rpt. 1930, pp. 52–58, figs. 2*).—Two experiments are noted.

The value of fish meal as a supplementary feed for dairy calves.—A lot of 6 calves was weaned from milk at 60 days and put on a ration composed of ground oats, ground yellow corn, white fish meal, and salt 44 : 40 : 15 : 1. They were allowed all the grain they would consume up to 5 lbs. per day and medium quality soybean hay ad libitum. At 6 months of age 3 of the calves showed no abnormal symptoms and were from 96.6 to 99.4 per cent normal in size. The other 3 calves had poor appetites, scoured badly, became stiff, and developed swollen joints and a nasal discharge. A group of similar calves was managed in the same manner, but their ration consisted of ground oats, ground yellow corn, white fish meal, dried skim milk, and salt 40 : 39 : 10 : 10 : 1. At 6 months of age these calves had developed no abnormal symptoms and were from 84.7 to 101.3 per cent normal in size. A third group received the same ration used in lot 2, except that menhaden fish meal was substituted for the white fish meal. At 6 months of age these calves were in good condition and very close to normal in size.

The rate of assimilation of calcium and phosphorus by dairy cows from a ration composed of native grown feeds.—A 10-day digestion trial with two high-producing cows on a ration of corn silage, chopped oat hay, and a grain mixture of equal parts of ground corn, ground oats, and cottonseed meal showed that both cows remained in practical equilibrium for both calcium and phosphorus retention. Both animals showed a positive calcium balance, while one was slightly positive and the other slightly negative in phosphorus balance. A second 10-day test, using the same feeds except that 5 per cent of white fish meal was added to the grain mixture, showed both animals to be in positive balance for both calcium and phosphorus.

[**Experiments with dairy cows**] (*South Dakota Sta. Rpt. 1930, pp. 16–18*).—Some of the following studies are continuations of previous reports (E. S. R., 63, p. 67).

Speltz v. corn, speltz v. barley for dairy cows.—A basal ration of alfalfa hay, corn silage, linseed meal, bran, and oats was fed with either corn, barley, or speltz to 7 cows during 3 40-day tests, using the reversal method. In this

test, speltz was equal to corn or barley for dairy cows, but was not a palatable feed.

Influence of sunlight on the growth and health of dairy heifers.—Further work in this study has shown that up to 2.5 years of age sunshine did not increase the weight or skeletal growth of heifers. On the basis of physical appearance lack of sunshine did not affect the health of growing heifers. There was no significant difference in the calcium and phosphorus content of the bones of heifers exposed to sunshine and those not exposed. A normal quantity of milk and fat was produed by the heifers not exposed.

Effect of milk from cows exposed to sunshine v. milk from cows not exposed on the growth and development of pigs.—In this cooperative study with the animal husbandry department, three lots of pigs were fed the same grain and mineral mixture and allowed no access to sunshine. One lot of pigs received milk from cows exposed to sunshine; the second lot, milk from cows receiving no sunshine; and the third lot, cod-liver oil. Lots 1 and 2 grew faster at first and made better gains than lot 3. After 5 or 6 weeks the pigs in lots 1 and 2 showed symptoms of rickets, were tender on their feet, and had a stilted walk. At the close of the test there were indications that the milk of the cows exposed to sunshine had a somewhat higher antirachitic value than that of those receiving no sunshine. It was also found that 8 lbs. of whole milk daily was not equivalent in vitamin D potency to feed containing 1 per cent of cod-liver oil.

[Dairy cattle experiments] (*Washington Col. Sta. Bul. 245 (1930), pp. 28, 29*).—Two studies by E. V. Ellington and J. C. Knott are briefly noted.

The use of dry skim milk in feeding dairy calves.—Calves fed for 2 weeks on whole milk, gradually changed to remade skim milk, fed remade skim milk for 2 weeks, and gradually changed to a grain mixture containing 25 per cent of dry skim milk made average daily gains of 1.5 lbs. per head during the first 6 months. Calves so fed compared very favorably with calves raised on separated skim milk.

A study of the gestation period of Holstein-Friesian cattle.—In a study with Holstein-Friesian cows it was found that the average length of 2,824 gestations which terminated with single births was 279.9 ± 0.063 days. Male calves were carried 1 day longer than females and twins 4.4 days less than single calves. The age of the cow had little influence on the length of the gestation period, and the gestation periods of individual cows varied greatly in length, seldom being uniform from one gestation to another. In all but a few cases the correlation between the length of time an animal was carried in dam and the length of the gestation periods of the calves she produced was not significant.

Corn silage feeding investigations.—Variations in hay consumption of dairy cattle with corn silages of different dry matter content, G. C. White, R. E. Johnson, and R. G. Connelly (*Connecticut Storrs Sta. Bul. 167 (1930), pp. 189–203*).—The sixth and seventh trials of this study (E. S. R., 62, p. 371) were made to determine the difference in hay consumption of cows receiving silage made from late-maturing and medium-maturing silage corn and from a very early-maturing variety of dent field corn. The hay was the only variable in the feeds offered, and the cows were allowed to consume all of it they would eat.

The hay-consuming capacity of the cow was found to be fixed by the quantity of dry matter supplied by the silage rather than by the actual amount of silage eaten. The cows and heifers on silage from the late-maturing corn ate 2.38 lbs. more hay per head daily than those on silage from the earlier-maturing corn. The cows did not immediately adjust their hay consumption to a sudden change in the quality of silage, often requiring 20 or more days to make the

adjustment. A change from a richer to a thinner silage may be accompanied by a decrease in milk production and loss in weight unless grain is fed during the adjusting period, while a change from a low quality to a richer silage may result in overeating and cows going off feed unless the grain ration is reduced.

Corn silage feeding investigations.—Optimum amount of silage in the dairy ration for economical production, G. C. White and A. D. Pratt (*Connecticut Storrs Sta. Bul. 169 (1930), pp. 233–251*).—During three successive trials, one group of cows received approximately 3 lbs. of silage per 100 lbs. of live weight and another group 1.5 lbs. (E. S. R., 64, p. 471). All other feeds were balanced except that hay was fed ad libitum. The cows in the light silage group ate more hay and maintained their milk flow and body weight about as well as the heavy silage group. The light silage ration was slightly more efficient in terms of dry matter per 100 lbs. of 4 per cent milk produced. The production cost per 100 lbs. of milk was the same with both rations.

While this test did not determine the optimum amount of silage to feed, it demonstrated that satisfactory results could be secured by the feeding of half the usual amount of silage.

[Experiments with dairy products at the Washington Station] (*Washington Col. Sta. Bul. 245 (1930), pp. 26–28*).—Two studies are noted.

A study of the correlation between cream quality as determined by various tests and butter quality, H. A. Bendixen and L. A. Black.—Accurate classification of cream for churning based upon flavor as determined by tasting and smelling was found to be impossible in a study with 31 churnings. A more regular gradation of butter scores resulted from classification by acidity than by flavor. Each increase in acidity and serum acidity of the cream was accompanied by a definite decrease in the score of the resulting butter. Such tests as H-ion concentration, a modified hot water test, and the alizarin test failed to grade cream any more accurately than the acidity test. Differences of as much as five points in flavor scores by judges in different parts of the country indicated a lack of standardization and a variation in quality of butter desired.

Bacterial content of high quality milk, L. A. Black and R. A. Graham.—A study of milk drawn aseptically from the udders of cows producing low count milk indicated that specific organisms are responsible for certain off flavors in milk of low bacterial content.

Straining milk on the farm, A. C. Dahlberg (*New York State Sta. Bul. 585 (1930), pp. 22, figs. 6*).—The essential factors involved in straining milk on the farm, including the reasons for straining, the selection of strainer, types of strainers with advantages and disadvantages of each, and the need for sterilizing strainers are discussed in this bulletin.

The effect of some southern roughages when fed with basic grain mixtures on the fat constants, flavor, texture, and standing-up properties of southern butter, J. S. Moore (*Mississippi Sta. Rpt. 1930, pp. 15–17*).—In this study it was found that Ayrshire cows on pasture and fed a grain ration consisting of 100 lbs. each of corn chop, ground oats, and wheat bran, and 200 lbs. of linseed meal produced butter similar to northern butter in 88 per cent of the samples scored. When cottonseed meal was substituted for the linseed meal, the butter produced was harder than northern butter. Changing the cows from pasture to alfalfa hay increased the melting point of the butter in 5 of 9 samples. For 14 days after changing from the ration containing cottonseed meal to the one containing linseed meal the residual effects of the cottonseed meal were apparent, but after 28 days the effects had apparently been eliminated. Adding alfalfa hay to either grain ration caused a sharp increase

in the iodine number, which remained about the same when the cows were removed from pasture and fed alfalfa hay, but dropped again when pasture was substituted for the hay.

In a comparison of the effect of corn silage and sorghum silage, it was found that the butter produced while fed these rations was about equal. The butter made from corn silage had a higher melting point, a lower Reichert-Meissl number, a slightly lower iodine number, and was more resistant to heat. In this phase of the study 36 samples of Ayrshire butter were scored, and all were similar to northern butter, except that a few samples were slightly softer. It was found that 83 per cent of the 18 Jersey butters scored were harder than northern butter. The Jersey butter had a higher melting point and a lower iodine number than the Ayrshire butter.

There was little difference in the quality of butter when the roughage portion of the ration consisted of either alfalfa, fine-stemmed soybeans, or lespedeza hay. Butter made when the ration consisted of alfalfa hay and a grain mixture of 100 lbs. each of corn chop, ground oats, wheat bran, and linseed meal had a higher average score than when sorghum silage was added to the ration. Eliminating the silage from the ration lowered the Reichert-Meissl number and increased the melting point, iodine number, and refractive index. The butter from Jersey cream churned quicker than that from Ayrshire cream, and the buttermilk contained less fat. The butter granules of Ayrshire cream were often soft and hard to work, while those of Jersey cream were harder.

Creamery inspection in New Jersey (ninth annual report), H. H. Tucker (*New Jersey Stas. Bul. 508 (1930), pp. 15, fig. 1*).—The usual report of the creamery inspection in New Jersey for the year ended June 30, 1929 (E. S. R., 59, p. 76).

VETERINARY MEDICINE

Handbook of parasitology, J. Guiart (*Précis de Parasitologie. Paris: J. B. Baillière & Son, 1930, 3. ed., rev., pp. XII+560, figs. 481*).—This is a third edition of the work previously noted (E. S. R., 49, p. 76).

[Report of the division of veterinary science], J. W. Kalkus and C. E. Sawyer (*Washington Col. Sta. Bul. 245 (1930), pp. 52, 53*).—Work with abortion in the Holstein herd at the Western Washington Station (see page 677) is briefly referred to.

In continuation of work with red water in cattle (E. S. R., 63, p. 274), calcium oxalate in glycerin capsules was fed to heifers. A heifer receiving 1,870 gm. in 101 doses failed to develop lesions characteristic of this disease, and one that was fed 8,540 gm. in 334 doses remained in excellent physical condition, having shown no indication of the disease.

[Report of the department of veterinary science] (*Western Washington Sta. Bul. 18-W (1930), pp. 35-43, fig. 1*).—In reporting upon fowl pox, reference is made by C. E. Sawyer and C. M. Hamilton to further field trials of the virus vaccine (E. S. R., 62, p. 557). From a questionnaire sent out in February regarding the death rate, egg production, and cases of natural fowl pox, 50 replies were received, in which 47 flock owners indicated their desire to continue the use of the virus vaccine on their pullet flocks. The reports show that only 27 of 45,000 birds that were vaccinated contracted fowl pox during the fall and winter months. The results of the vaccination according to the reports from these poultrymen justified the use of vaccine on pullets between 3 and 4 months of age, and 22,000 fowls on 21 poultry farms were vaccinated by the station during the summer of 1930. During the summer 100,000 doses of fowl pox vaccine were sent to veterinarians and poultrymen who had secured permits from the State department of agriculture for its use.

An account is given by the same authors of further work with infectious bronchitis (E. S. R., 62, p. 557). The infectious nature of the disease was definitely proved by passing one strain of the causal agent through 51 groups of birds. No treatment has been found by the station which is of any value in combating an outbreak of the disease in a flock.

Control work with coccidiosis of chickens through soil disinfection was conducted by Sawyer and Hamilton, this having been the most prevalent of any poultry disease in western Washington.

In the eradication work with abortion in the station herd, reported by J. W. Kalkus and Sawyer, sera from three cows continued to react positively to the agglutination test, indicating that the acriflavine which had been injected intravenously in the fall of 1927 (E. S. R., 60, p. 775) had no effect on the agglutinability of the sera of these animals.

Annual report of the chief veterinary research officer, 1929 (*Kenya Colony Dept. Agr. Ann. Rpt. 1929, pp. 174–365; 366–376, fig. 1; pp. 377–417*).—An account of the administrative research work is reported under the headings of Rinderpest, by J. Walker (pp. 184–210), and by R. Daubney (pp. 210–224); East Coast Fever (pp. 224–236) and Redwater, Anaplasmosis, and *Gonderia mutans* (pp. 237–239), both by S. H. Whitworth; Pleuro-pneumonia Contagiosa Bovum (Lung Sickness of Cattle), by J. Walker (pp. 240–243); Nairobi Quarantine Disease, by R. W. M. Mettam (pp. 243–293); Trypanosomiasis: Experimental Treatment, by R. Daubney (p. 293); Horse Sickness: Prophylactic Vaccination Experiments, by S. H. Whitworth (pp. 294–324); Heartwater (*Rickettsia ruminantium*), by R. Daubney (pp. 325–332); Laikipia Lung Disease, by R. W. M. Mettam (pp. 333–362); Nairobi Sheep Disease (p. 365) and Abscesses in the Brain of Sheep (p. 365), both by R. Daubney; East African Swine Fever, by J. Walker (pp. 366–376); and Poisonous Plants of Kenya—Part I, by R. W. M. Mettam (pp. 377–417).

Preliminary studies on white snakeroot, W. E. Krauss and H. A. Runnels (*Ohio Sta. Bul. 470 (1931), pp. 150, 151*).—White snakeroot plants gathered in the vicinity of Wooster were fed to a Jersey cow at the rate of 3.5 lbs. a day for a period of 47 days. The cow exhibited no untoward symptoms at any time during the period. The milk from this cow was fed each day to rats, rabbits, one calf, and one lamb with no untoward effects, indicating that this plant may vary in its toxicity according to certain unknown factors.

So-called "alkali disease" (*South Dakota Sta. Rpt. 1930, pp. 14, 15*).—In feeding experiments with the white rat in a study of the so-called alkali disease it proved to be a satisfactory experimental animal, autopsies of more than 60 rats having shown the same lesions as were found the preceding year in 4 hogs and the horse. The work indicates that the disease is not due to bacterial infection. There are indications that the salt content of water may have a very decided influence on normal metabolism.

Infectious abortion of cattle, swine, and sheep in the United States, W. E. Cotton (*Vet. Med., 26 (1931), No. 2, pp. 66–74*).—This is a contribution presented at the eleventh International Veterinary Congress, held in London in 1930.

Bovine infectious abortion, B. H. Edgington and A. Broerman (*Ohio Sta. Bul. 470 (1931), pp. 158–161*).—A report of studies made with a view to determining if abortion in heifers exposed to *Brucella abortus* infection after reaching sexual maturity but protected from additional infection for a period prior to breeding includes data presented in tabular form. Two methods were used for infecting heifers, (1) by feeding and (2) by vaginal injection of *B. abortus* cultures. The Shorthorn heifers, which were purchased from ship-

ments of range feeder calves approximately 6 months of age, and raised to maturity in quarters free from abortion infection, were about 1.5 years old when bred.

On the 9 aborting heifers in the vaginal infection group that were bred from 41 to 100 days before infection, abortion took place from 74 up to 182 days after infection. Whether failure to cause abortion in the heifers that were exposed prior to breeding resulted from complete elimination of infection or was due to a resistance established by this exposure was not determined. The chance of producing a resistance to *B. abortus* infection as a result of vaginal infection of unbred heifers with living cultures appears to merit consideration and other investigations of this character are under way.

In a study of the agglutinin production in pregnant and nonpregnant heifers by vaginal injection of *B. abortus* cultures, 7 heifers negative to the agglutination test for abortion were injected intravaginally with living cultures, 3 being pregnant, the others unbred, at the time of the injections. The results, with the agglutinin titer of the blood serum presented in tabular form, show the 3 heifers which were pregnant at the time of injection with *B. abortus* cultures to have developed and maintained high agglutinin titers, each heifer having aborted. The 4 heifers unbred at the time of vaginal injection showed an agglutinin response, 2 of these ceasing to show agglutinins 5 months before calving.

In considering the relationship of the udder to persistence of *B. abortus* infection in cows, it is pointed out that the udder, gravid uterus, and the lpmph glands appear to be the only tissues of the cow in which the organism will be retained and reproduce.

Elimination of positive reactors to contagious abortion, A. N. Hume (*South Dakota Sta. Bul. 253 (1930), pp. 25, 26*).—A brief account is given of the successful elimination of infectious abortion from the small herd at the Vivian Substation through the application of the agglutination test, sanitation, and building up of the herd through the replacement of those removed with new animals that had reacted negatively to the test.

Carbohydrate and serological determinations of the bipolar gas-forming and non-gas-forming organisms isolated from lymph glands of slaughtered cattle, O. Garcia (*Philippine Jour. Sci., 43 (1930), No. 4, pp. 565–575*).—In continuation of the investigations reported in 1927 (E. S. R., 58, p. 477), in which gas-forming bipolar organisms were reported, search was made for other types of these organisms, taking advantage of the ease of isolating them in pure culture from organs of slaughtered cattle. Both gas-forming and nongas-forming bipolar organisms were isolated from the lymphatic adenitis of slaughtered animals which were morphologically alike.

"The gas-forming organisms fermented glucose, galactose, levulose, maltose, sorbitol, dulcitol, inulin, and mannose. The nongas-forming organism fermented glucose, galactose, levulose, maltose, sucrose, sorbitol, mannitol, inulin, and mannose. Therefore, the organism was identified as *B[acillus] boviscpticus*. Neither type grew on eosin-methylene blue-lactose agar. Each type gave definite and distinct biochemical and serological reactions of its own. Both types were pathogenic for rabbits and guinea pigs."

Iodine prevents goiter in new-born lambs, D. S. Bell (*Ohio Sta. Bul. 470 (1931), pp. 164, 165, fig. 1*).—It was found that ewes which in 1929 had given birth to lambs affected with goiter yeaned healthy lambs in 1930 after having been allowed free choice during the last 8 weeks of pregnancy of a mixture of 1 oz. of potassium iodide with each 100 lbs of flake salt.

Hog cholera and allied diseases, G. H. GLOVER (*Colorado Sta. Bul. 358 (1930), pp. 10*).—A practical account of hog cholera, necrotic enteritis, swine plague, and hog "flu."

The presence of Gastrophilus inermis (Brauer) in France [trans. title], G. DINULESCU (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No. 5, pp. 319, 320; abs. in Rev. Appl. Ent., 18 (1930), Ser. B, No. 5, p. 99*).—In this further contribution (E. S. R., 63, p. 259) the author records the discovery of the third-stage larvae of *G. inermis* in the rectum of horses slaughtered at the abattoir. Removed from the mucous membrane and placed in dry sand at a temperature of from 25 to 28° C. (77 to 82.4° F.), they continued pupal development and adults emerged after 21 to 26 days. The author finds that after the first molt in the buccal mucous membrane the larvae pass to the rectum, where development in the second and third instars is completed, and that on being expelled they burrow into the soil to continue pupal development.

[Report of work in avian pathology at the Ohio Station] (*Ohio Sta. Bul. 470 (1931), pp. 186–191*).—In a study of the longevity of avian coccidial oocysts, by B. H. Edgington and A. Broerman, droppings and cecal contents obtained at autopsy of coccidial infected fowls were moistened with 2.5 per cent potassium dichromate solution and allowed to sporulate for from 3 to 4 days at room temperature. This material was then diluted with the dichromate solution until each cubic centimeter contained approximately 100,000 oocysts, after which it was passed through gauze and stored in a refrigerator at from 38 to 42° F. The infectivity of the oocysts was demonstrated after a period of 2 years in storage by oral administration of 1-cc. doses of the material to 30-day-old chicks. In an outdoor test of the duration of infectivity of coccidial material droppings from pens containing infected fowls were scattered over the surface of the inclosure in July, 1928, and chicks from 30 to 40 days old placed in the pen at different times within the following 4 months. The percentage of deaths from coccidiosis resulting ranged from 38 to 55. In November all the remaining birds were removed and the pen was closed until the following June, when 40 35-day-old chicks were placed therein. Only 1 of these chicks died during the 3 weeks that they were held in the pen.

Feeding tests conducted by Edgington and Broerman with a view to determining the effect of galvanized milk containers on the mortality of chicks gave little evidence that milk fed in such containers is injurious to baby chicks.

Tests by R. E. Rebrassier and D. F. Bent, jr., of the efficiency of cinchona in the control of avian coccidiosis failed to give evidence of any benefit. In tests by them of the toxicity of kamala for chickens no visible effect was noted in doses up to 8 gm., but a pronounced diarrhea and general depression was observed in all birds treated, followed by death in from 1 to 10 days of all but 4 of the 18 birds to which doses of 9 and 10 gm. of kamala containing 4.53 per cent of ash was administered. A post-mortem examination revealed the presence of a considerable amount of kamala in the crop, a severe enteritis, and whitish deposits on the visceral organs, especially in the kidneys. Tests of the efficiency of kamala as an anthelmintic for tapeworms in poultry indicate that in the doses used, namely, from 7.5 to 15 grains, it was not highly efficient in the removal of tapeworms from chickens.

In a study of the immunity or resistance of chickens to roundworms (*Ascaridia lineata*), by Rebrassier and McCrory, lots which received neither ova nor extract made the greatest gain, while the birds receiving ova and extract showed greater gain in weight than the group receiving only ova.

Vaccinating fowls for chicken pox, W. A. James and R. Graham (*Illinois Sta. Circ. 363 (1930), pp. 14, figs. 9*).—A practical account, with the details of cutaneous vaccination.

Effect of pullorum disease on second year egg production, J. Biely (*Sci. Agr., 11 (1930), No. 4, pp. 221–227, fig. 1*).—In this further work (E. S. R., 63, p. 876), the author records observations on the second year egg production of 44 White Wyandotte hens reacting positively and 27 reacting negatively to the agglutination test for *Salmonella pullorum*. These birds were trap nested from February 15 to August 15, 1928, and tested each month.

"The mean production of reactors was 55.75 ± 3.19, as compared to 81.55 ± 2.64 of the nonreactors, forming a statistically significant difference of 31.8 ± 4.13. The egg production of reactors was more variable than that of nonreactors, the respective coefficients of variation being 56.24 ± 3.17 and 23.22 ± 1.76, a difference of 33.02 ± 3.63, which is also statistically significant. The range of production of the reactors was 0–122 eggs, while that of the nonreactors was 25–113 eggs. The proportion of the reacting and the nonreacting hens in different fecundity classes was: 74 eggs or less—70.4 per cent of the reactors and 22.3 per cent of the nonreactors, 75–100 eggs—18.2 per cent of the reactors and 44.4 per cent of the nonreactors, 100 eggs or over—11.4 per cent of the reactors and 33.3 per cent of the nonreactors."

Resistance of chickens to parasitism affected by vitamin A, J. E. Ackert, M. F. McIlvaine, and N. Z. Crawford (*Amer. Jour. Hyg., 13 (1931), No. 1, pp. 320–336*).—This is a contribution from the Kansas Experiment Station, in which 60 White Leghorn chickens of from 7 to 8 weeks of age were used in two preliminary tests and 127 from 4 to 7 weeks old in four experiments in the attempt to ascertain if their resistance to the intestinal roundworm *Ascaridia lineata* Schneid. was affected by vitamin A in the diet. Cod-liver oil was used as the source of vitamin A. The numbers and lengths of *A. lineata* remaining in the intestines of the chickens at the close of the experiments were used in judging whether this vitamin affected the resistance of the chickens to the parasites.

"During the 5-week periods of the experiments the characteristic avitaminosis A eye disease, ophthalmia, occurred repeatedly among the chickens on the vitamin A deficient diet, but was wholly absent from the chickens on the diets adequate for this vitamin. Significantly larger numbers of *A. lineata* remained in the chickens of group 1, whose diet was deficient in vitamin A, than in the chickens of groups 2 and 3, whose diets were adequate for vitamin A. The average total worm length per chicken was significantly greater in group 1 (on diet deficient in vitamin A) than from the chickens of group 2 or of group 3."

The results indicate that the resistance of growing chickens to *A. lineata* was lowered when the fowls, 4 to 7 weeks of age, were kept on a diet deficient in vitamin A for a period of 5 weeks.

Resistance of chickens to parasitism affected by vitamin B, J. E. Ackert and L. O. Nolf (*Amer. Jour. Hyg., 13 (1931), No. 1, pp. 337–344, fig. 1*).—In addition to the tests conducted at the Kansas Experiment Station above noted, preliminary tests involving 90 chickens and three regular experiments on 135 chickens were conducted to determine if the vitamin B complex is a factor in the resistance of chickens to the intestinal roundworm *Ascaridia lineata* (Schneid.).

"The results of the experiments showed that groups of chickens given the same number of embryonated eggs of the parasite had more worms when their diets lacked vitamin B than did similar groups of chickens whose rations contained adequate amounts of this vitamin. The larger numbers of worms

are attributed in part to partial paralysis of the intestine due to lack of vitamin B, the greatly weakened peristalsis probably aiding the worms in remaining in their habitat. Larger *A. lineata* were found in those chickens whose diet contained yeast than in the groups whose rations lacked it. It is suggested that the yeast may contain a factor which is favorable to the growth of the worms."

Insect and other external parasites of poultry in Canada, A. Gibson (*Sci. Agr., 11 (1930), No. 4, pp. 208–220*).—A compilation of information on the insect parasites of poultry in Canada.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Mississippi Station], J. W. Carpenter, jr. (*Mississippi Sta. Rpt. 1930, pp. 8, 9*).—Cotton ginning tests made in cooperation with the U. S. D. A. Bureaus of Agricultural Economics and Public Roads emphasized the damage to fiber due to ginning with tight breast roll. The increased value of lint ginned with loose breast roll more than compensates for the decrease in capacity of the gin, which in some cases amounts to approximately 50 per cent. Wet cotton or sappy cotton may be successfully dried either by sunning, by heated air, or by cold air which has been chemically dehydrated. Cotton was dried successfully with air which had been dehydrated by passing through calcium chloride.

[Agricultural engineering investigations at the Ohio Station] (*Ohio Sta. Bul. 470 (1931), pp. 205–224, figs. 18*).—Investigations by G. W. McCuen and N. R. Bear of mechanical methods of seed bed preparation showed that where disking alone was done in sweetclover the best seed bed was obtained when the clover was disked once and allowed to lie for weeks before final disking. Such preparation did not cause a serious weed problem during the wet year of 1929. Germination of seed was slower on disked and pulverized plats than on plowed plats. Chiseling was more effective in dry years than in wet years. In a dry year four different methods of seed bed preparation were of equal value.

Field tests by R. M. Salter and C. O. Reed of corn planter fertilizer attachments showed that the close proximity of seed and fertilizer resulted in reduced stands, especially notable for the heavier rates with a consequent reduction in yield. The early growth was excellent for the 100-lb. rate but was less so at the heavier rates, and actually less than the checks for the 400-lb. application.

Placing the fertilizer in a shoe furrow between the hills and at some distance from the seed was safe as indicated by stand, but it had little favorable influence on early growth. The experimental planter developed in an attempt to obtain placement in two lateral bands 2 by 7 in., one on either side of the seed, separated 3 in., and approximately 0.5 in. above the seed level, appeared to be both safe and efficient. For all rates the stand was slightly in excess of the check, while early growth was also good with no evidence of retardation at the heavier rates.

Combine investigations by E. A. Silver and Bear showed that cutter bar losses are less when cutting a low or short stubble because of a minimum of heads slipping by under the knife bar. The losses resulting from a thin stand are extremely heavy when cutting high stubble. The percentage of straw breaking in a thin crop is greater than that in a heavy crop. This feature again produces a heavy loss by the drooping heads being cut off and dropping to the ground, especially when cutting a high stubble. An 11- or 12-in stubble has the best ability to support the windrow where the fingers of the pick-up have

a better chance to get under it. On a short stubble the windrow is so close to the ground that the pick-up fingers do not get a chance to get under the windrow for efficient elevation. A windrow on a medium length stubble will also stand up better when heavy rains are experienced. The general conclusion is that with an average crop the threshing losses are less with the higher stubble.

Feed grinding investigations by Silver involved tests of 12 mills of 5 different types, including burr, combination, rigid hammer, triple reduction process hammer, and swinging hammer mills. The grains and roughages ground were oats, barley, shelled corn, ear corn, alfalfa, corn stover, and soybean hay. On each test four runs of from 2 to 7 minutes' duration were made, comprising full capacity, three-quarter, one-half, and one-quarter capacity.

The results indicate that on fairly coarse grinding the burr mills exceeded the hammer type of mills, but the advantage decreased on fine grinding. On the shelled-corn grinding the burr mill ground to the fineness of 3.9, while the hammer mills ground to 3. For ear-corn grinding, which has a modulus of fineness of 3, the burr mill began to drop until on the oats grinding, done at a modulus of fineness of 2.7, it reached the lowest efficiency. The temperature of the materials after grinding was very much higher from the burr mills than that from the hammer mills because of friction in the grinding or burr chamber.

The rigid or straight hammer type of hammer mills seemed to excel all the others in efficiency. It was surpassed in the shelled-corn grinding by the burr mill and only slightly in the oats grinding by the triple reduction process hammer mill, which cuts the material with knives for the first reduction, then pulverizes the material by heavy, revolving disks or similar devices, and accomplishes the final reduction by the material coming in contact with revolving hammers. The triple reduction process hammer mill showed fair efficiency, while the swinging hammer type of hammer mill and the combination type of burr mill were consistently low in efficiency.

In grinding roughages the straight hammer type of hammer mill ranked well toward the top, surpassed only in soybean hay grinding by the triple reduction process hammer mill. Again, the swinging hammer type of hammer mill and the combination burr mill were consistently low. On fairly coarse grinding such as in the corn stover tests, the combination mill began to show a higher efficiency because it requires less power to cut the material than it does to pulverize it between a set of burrs. The hammer mill required more horsepower above a fineness modulus of 3 and the burr mill required less. Below a modulus of fineness of 3 the burr mill required more horsepower and the hammer mill less.

On shelled-corn grinding the burr mill required less horsepower than the hammer mill to any fineness over 2.45. Below this fineness the hammer mill required less than the burr mill. The grinding range for burr mills on shelled corn was much greater than that of the hammer mills. With the lower speeds a more coarsely ground product is obtained with hammer mills, and with the higher speeds a more finely ground product. Very little of the grains—barley, oats, and shelled corn—will pass through a screen smaller than a 3/32 in. The data also indicate that there is very little change in fineness with a screen above the ½-in. size. The greatest variation in fineness occurred with the screens from 3/32 to ½ in. When no screen was used there was very little difference in the fineness over that when the mill was equipped with the 1¼-in. screen.

Experiments by V. L. Overholt on the use of dynamite in the maintenance of open ditches indicated a higher efficiency for concentrated loading. Dynamite is a quick and easy means of removing obstructions from the channel, and can often be used economically on jobs too small to warrant the use of dredging equipment. It scatters the material, thus avoiding high spoil banks. Dynamite can not be safely used where the ditch passes near buildings or other structures. Best results can be obtained only when the soil is completely saturated, but there should not be a great amount of water in the ditch at the time of blasting. It is necessary to use dynamite sensitive enough to be fired by propagation. Under favorable conditions it will require 0.63 lb., or a little more than one stick of dynamite, to remove 1 cu. yd. of soil.

[Agricultural engineering investigations at the South Dakota Station] (*South Dakota Sta. Rpt. 1930, pp. 3-5*).—Investigation of the windrower in connection with the combine study showed that in a clean field heavy windrows were not objectionable so far as drying out of the grain is concerned. There was less loss in picking up the grain at 2 miles per hour than when picking it up at 3 miles per hour with all sized windrows. This loss was very heavy on the larger sized windrows.

The combine threshed a swath of from 4 to 6 ft. wider than its cutting width without loss in a field of oats yielding 52 bu. per acre. When the rate of travel was increased or the width of swath extended above this, the losses were increased both as to shattering and threshing. A fairly heavy windrow stayed in good condition for a period of a month, regardless of ordinary rains. Heavy windrows kept better than smaller ones as they stayed up on the stubble better.

In the study of corn harvesting machinery, it was found that the optimum diameter of the husking roll is between 3.5 and 4 in., the optimum length of husking roll for a stationary husker is from 36 to 42 in., the most satisfactory husking peg is a flat-headed stud, the optimum speed for husking rolls is 300 r. p. m., the optimum angle for the husking rolls in the bed is from 18 to 22 in., and a machine allowing an adjustable angle to suit the moisture content in the husks of the snapped corn is desirable. One ear retarder at the top of the husking bed is most satisfactory.

The study of the use of rammed earth for farm building walls showed that a considerable amount of sand is necessary in dirt to be used for this purpose, and that South Dakota soils generally are lacking in sand. The sand is necessary to absorb the shrinkage stresses as the block dries out. The allowable moisture content in soils varies inversely as the amount of sand in the soil.

Surface water supply of the United States, 1926, II, XII B (*U. S. Geol. Survey, Water-Supply Papers 622 (1930), pp. IV+118, fig. 1; 633 (1931), pp. VI+263, fig. 1*).—Part 2 of this report, prepared in cooperation with the States of Virginia and North Carolina, presents the results of measurements of flow made on streams in the South Atlantic slope and eastern Gulf of Mexico Basins during the year ended September 30, 1926. Part 12 B, prepared in cooperation with the States of Idaho, Oregon, Nevada, and Washington, presents corresponding results for this period for streams in the Snake River Basin.

Surface water supply of the United States, 1927, IV, IX (*U. S. Geol. Survey, Water-Supply Papers 644 (1930), pp. V+156, fig. 1; 649 (1930), pp. V+99, fig. 1*).—Part 4 of this report, prepared in cooperation with the States of Wisconsin, Illinois, Ohio, and New York, presents the results of measurements of flow made on streams in the St. Lawrence River Basin during the year

ended September 30, 1927, and part 9, prepared in cooperation with the States of Colorado, Wyoming, Utah, California, and Arizona, presents corresponding results for this period for streams in the Colorado River Basin.

Progress report of the irrigated eighty-acre demonstration farm unit of the Harney Branch Experiment Station, 1927–1930, O. SHATTUCK and R. E. HUTCHISON (*Oregon Sta. Bul. 270 (1930), pp. 38, figs. 6*).—This report states that the cost of a suitable engine and pump, installation, etc., in the Harney Valley will vary from $2,500 to $4,000. The pumping cost will vary from $5 to $10 per acre-foot of water. The cost of the distribution system and leveling of land will vary from $10 to $30 per acre. The data upon the cost of producing standard crops under irrigation indicate that these crops can be produced at a satisfactory profit with water pumped from wells within the probable pumping lift in the Harney Valley.

The tract is irrigated from an 18-in. drilled well, 85 ft. deep, cased to a depth of 60 ft. with 12-gauge galvanized steel casing. A Kimball turbine pump is used, operated by a 25 h. p. semi-Diesel oil engine. The total first cost of the well and pumping plant was $4,134. This includes the weir box, turnouts, and flume, and also the compressed air starting equipment installed in 1930. Leveling and constructing permanent ditches cost $16.03 per acre up to 1930.

For the 4 years the average annual application of water was 1.27 acre-ft. per acre of crop. After allowing all costs of production, including depreciation of equipment and pumping plant, the crops grown on the demonstration farm unit gave a return on the capital investment of 11.6 per cent in 1927, 5.6 per cent in 1928, 47.9 per cent in 1929, and 8 per cent in 1930, averaging 18.2 per cent for the 4 years. The most promising crops for the conditions of this demonstration seem to be alfalfa hay, wheat intercropped in row alfalfa producing seed, and potatoes.

Rice farm irrigation systems in Louisiana, 1929, R. J. SAVILLE (*Louisiana Stas. Bul. 216 (1930), pp. 19*).—The results of a survey of rice irrigation systems and practices in Louisiana during 1929 are reported.

The yield per acre of rice was slightly higher on farms using deep-well water, although it is considered doubtful that the water source is the determining factor in this connection. Two-thirds of the irrigation plants had Diesel engines. The usual size of Diesel engine has a capacity suited to flooding a larger acreage than prevails on many rice farms. The proportion of the farm investment in the irrigation plant varied from 20.5 per cent on the small farms to 10.3 per cent on the large farms.

Water rentals varied directly with yield per acre and the price of rice, usually amounting to one-fifth of the value of the crop delivered in the warehouse.

About 60 per cent of the farmers using Diesel engines flooded for a total outlay of from $5 to $10 per acre. Seventy per cent of them had operating outlays of less than $4 per acre. Farmers equipped to flood 400 acres were able to keep their total outlay down to about $6.50 per acre. Those operating from 101 to 200 acres had a total outlay of $10.38 per acre. Operating labor outlay tends to decrease as the area flooded is increased, because the total outlay for pumping labor increases very little after the pumping requires the attention of two full time men.

Electric motors are rapidly replacing Diesel engines as a source of power for irrigation purposes, although the latter can be operated at a much lower operating outlay than can electric motors. It is only when the Diesel engine must be overhauled or is worn out that other needed outlays are involved. The

block rate for electrical energy consumption favored the large operator. Small operators were unable to take advantage of the lower range of rates because of low energy consumption.

Higher labor incomes were secured by farmers operating private irrigation plants. Much of the difference in income was due to the larger volume of business handled by them.

Sprinkler irrigation of orchards, C. C. Wright (*Washington Col. Sta. Bul. 245 (1930), p. 64*).—Sprinkler irrigation experiments conducted at the Irrigation Substation showed that with a total of from 2 to 3 acre-ft. of water applied only the surface 2 or 3 ft. are moistened. There was some evidence also that there would be a cumulative depletion of the moisture from the lower layers of soil if this method of irrigation were to be continued.

Public Roads, [December, 1930] (*U. S. Dept. Agr., Public Roads, 11 (1930), No. 10, pp. 189–208+[2], figs. 21*).—This number of this periodical contains the status of Federal-aid road construction as of November 30, 1930, together with the following articles: Bituminous Treatments Used on Roads of Intermediate Type in the Western States, by J. T. Pauls (pp. 189–200, 208); and The Most Recent Methods Adopted for the Use of Tar, Bitumen, and Asphalt in Road Construction.—Report of American Engineers to the Sixth International Road Congress, by A. W. Dean, R. H. Baldock, G. H. Henderson, P. Hubbard, and C. H. Moorefield (pp. 201–208).

Air cleaners for motor vehicles, A. H. Hoffman (*California Sta. Bul. 499 (1930), pp. 66, figs. 42*).—This bulletin describes and presents the results of tests of 88 different air cleaners for internal-combustion engines. The test results indicate that the proper installation and servicing of a good air cleaner means less engine wear, less trouble, less expense for fuel, oil, repairs, and breakdowns, quieter running, and greater dependability. A cleaner should offer the least possible restriction to the passage of air through it.

Most of the air cleaners now sold, if properly selected as to size for the engines on which they are to be used and if kept clean, do not appreciably affect the power or acceleration of road vehicles at speeds of 40 miles per hour and under. Above 40 miles per hour the effects of high restriction and of insufficient servicing are much more marked. Air inlets should not face the blast from the radiator fan and elbows and long tubular connections should be avoided. Air leaks in the connections between the air cleaner and the carburetor are detrimental. All good air cleaners require some servicing.

Air cleaners of different makes and types differ markedly in their behavior in use. The dry centrifugal type cleaners now marketed do not afford adequate protection. At low air speeds this type loses practically all of its efficiency. Tightly woven or felted dry filters and tightly packed plain oily filters afford good protection, but have often caused trouble from increasing restriction when not sufficiently serviced. Loosely packed plain oily filters usually do not offer much restriction, even if neglected, unless clogged by leaves, chaff, or insects. Many are too thin to afford satisfactory protection; some give excellent protection if sufficiently serviced.

Self-washing oily filters, if well designed and sufficiently serviced, generally afford excellent protection even in extreme dust. This type is well adapted for tractors, large trucks, and busses. Some makes have low restriction, others somewhat higher; some are simple in design, others rather complicated; and in some the washing action is vigorous and effective, in others it is inadequate.

Most air cleaners to some extent muffle carburetor noises. Many of them also serve to minimize the danger of gasoline being ignited by backfires. The

principle of the Davy safety lamp applies, i. e., chilling the burning gases by passing them through small openings in metal or other heat-absorbing material.

Poultry housing, M. W. Miller and J. S. Carver (*Western Washington Sta. Bul. 18-W (1930), pp. 25-27*).—The organization, procedure, and equipment of a controlled poultry housing study at the station is briefly described. No appreciable temperature difference was recorded between straw loft and wooden ceiling. Drier conditions were found to exist on concrete floors laid on the ground than on concrete floors supported on a board floor from 6 in. to 3 ft. from the ground. Apparently the value of solid partitions was demonstrated.

Construction of chimneys and fireplaces (*U. S. Dept. Agr., Farmers' Bul. 1649 (1930), pp. II+18, figs. 16*).—This is a revision of and supersedes Farmers' Bulletin 1230 (E. S. R., 46, p. 386). It presents practical information on the planning and construction of fireplaces and chimneys.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics and rural sociology at the Ohio Station, 1929–30] (*Ohio Sta. Bul. 470 (1931), pp. 197-204*).—Investigations not previously noted are reported on as follows:

Cost of horse work in northwestern Ohio, F. L. Morison.—Cost records for 1926–1928 of 23 Putnam County farms showed the net cost per year of keeping a work horse to be $102.59. Feed comprised 56 per cent, man labor 24, and other items 20 per cent of the cost. The horses worked an average of 867 hours per year. The per hour cost ranged from 9.5 to 18.7 cts. on different farms. The farms averaged 140 acres, of which 104 were in crops. The average number of horses per farm was 4.2.

Roadside markets, C. W. Hauck.—A count of 2,063 patrons at 2 representative markets near Columbus showed that 13.8 per cent stopped at the markets on Saturday and 27.1 per cent on Sunday, and 11.4 to 12.6 per cent stopped on each of the other days. Over 62 per cent stopped between 3 and 8 p. m., the peak being between 5 and 6 p. m. On a typical thoroughfare near Columbus 80 per cent of the patrons came from the traffic lane nearest the market. On a country road in the same county with less than 15 per cent as much traffic, almost 40 per cent of the patrons crossed to a market on the opposite side of the road. A typical country retail market had an average of 558 customers per week, with sales totaling $399.20.

Ohio agricultural income, V. R. Wertz.—Net cash income of the Ohio agricultural industry in 1929 was $131,844,000, as compared with an average of $164,419,000 per year for the period 1924–1928. The indexes increased from 100 for the period 1910–1914 to 106 for production, 110 for sales, 149 for prices, and 164 for gross cash income for the period 1925–1928.

Variation in yield of hogs, G. F. Henning.—A carload shipment by the Kenton Cooperative Association on August 19, 1930, of hogs from 9 farms showed that the warm dressed weights of the different lots varied from 71.94 to 83.33 per cent of the home weights, averaging 76.16 per cent.

Tax delinquent real estate, H. R. Moore.—Accumulated delinquent real estate taxes in Ohio increased from 4.38 per cent of all real estate taxes levied in 1912 to 13.4 per cent in 1928. In 88 rural townships the increase was from 2.56 to 7.75 per cent. Prosperous rural counties showed the smallest percentage of delinquency and urban counties the highest.

The movement of open country population, P. G. Beck and C. E. Lively.—Records on about 800 boys reared in the open country (91 per cent on farms) showed that the group with the lowest percentage in agriculture started for

themselves before 1899. The percentage in agriculture then increased gradually to a maximum, 45 per cent, for the group starting in the period 1908–1918. Of the boys originally farmers, 20 per cent later went into other occupations, while only 5 per cent of those originally in nonagricultural occupations returned to the farm.

[Investigations in agricultural economics at the South Carolina Station, 1929–30] (*South Carolina Sta. Rpt. 1930, pp. 6–22, figs. 5*).—The results of investigations not previously noted are reported on as follows:

[*Farm land prices*], W. C. Jensen and B. A. Russell (pp. 7–10).—Further analysis of the study previously noted (E. S. R., 59, p. 183) showed that the value of land is dependent on the value of the cash crops or livestock produced; that a permanent plan of economic utilization of land involves production problems, incomes and investments from land, and various social problems; that kind of tenure influences the system of agriculture and land values and size of farm; and that the ratio of exchange between the prices of cost goods and of commodities produced is one of the main factors affecting the prosperity of farming.

The average sale prices of land sold in Florence County declined from $25 per acre in 1928 to $18 in 1930. The sales indicated that from 60 to 75 per cent of the sales were made in October to December, inclusive.

[*Farm credit*], W. C. Jensen and M. Guin (pp. 10–13).—In Florence County 11 of the 34 owners studied used long-time credit, the average per farm being $1,625, equal to 7 per cent of the total assets. In the Piedmont area 23 of 56 farms studied were mortgaged, the average debt being $2,148, equal to 13 per cent of the assets.

From 1917 to 1926, inclusive, the average loss per farm due to sickness was about $300 in the Piedmont area, $34 in the sand hills area, and about $500 in the Coastal Plains area. Losses in the sand hills area due to bank failures averaged $1,927. In the Piedmont area 17 of the 76 farmers studied carried life insurance averaging $1,841, and 75 per cent of the owners had fire insurance. In the Coastal Plains area 32 per cent carried life insurance averaging $1,237, and 38 per cent of the owners had fire insurance. Four farmers had hail, wind, or other forms of insurance.

Farm organization and management in the Pee Dee area, W. C. Jensen (pp. 13–15).—The average return on farm investments averaged about 6 per cent. The costs of production on 16 farms studied varied from 6 to 58 cts. per pound for cotton, 5 to 96 cts. per pound for tobacco, and from 47 cts. to $4.38 per bushel for corn.

[*Cotton marketing*], W. C. Jensen, M. Guin, and H. A. White (pp. 19–21).—Of the 1929 cotton crop of South Carolina, approximately 36 per cent was of staple length of $\frac{15}{16}$ in. or longer. A study of prices in 9 representative markets showed the following discounts and premiums per bale for different staple lengths as compared with the price of $\frac{7}{8}$-in. staple: $\frac{13}{16}$ in. and under from $1.25 to $2.65 discount, $\frac{15}{16}$ in. from $1.40 discount to $1.85 premium, 1 and $1\frac{1}{32}$ in. from a discount of $1 to a premium of $5.25, and $1\frac{1}{16}$ and $1\frac{3}{32}$ in. a premium of from $2 to $8.60.

Some economic problems in the rice farming area, 1929, R. J. Saville (*Louisiana Stas. Bul. 217* (*1930*), *pp. 65, figs. 2*).—This is a preliminary report based chiefly on data collected in the fall of 1929 from 124 rice growers in Acadia and Jefferson Davis Parishes, La. The supply and price relationships, investments, income and expenditures, labor income, yields of rice per acre and the relation of different factors to yield, livestock production, and land rent and real estate taxes and their relation to each other and to labor income are discussed.

The study of the relation of production of rice to purchasing power at the December 1 price showed the following for the period 1921–1929 between United States production and Louisiana production and United States purchasing power and Louisiana purchasing power: Production 80 per cent of normal, United States price 140 per cent, and Louisiana price 141 per cent of normal; production 90 per cent of normal, United States price 117 per cent, and Louisiana price 118 per cent of normal; production 110 per cent of normal and both prices 87 per cent of normal; and production 120 per cent of normal and both prices 76 per cent of normal. In 7 of the past 10 years the relative price of rice has been below the average for all farm products.

The practices leading to increased yield per acre have tended to quicken competition among growers, apparently to the benefit of other interests. Of the farms studied those with labor incomes less than 50 per cent of the average for their size group received 21 cts. less per barrel than the average for all farmers, while those with incomes over 50 per cent above the average received 16 cts. per barrel more than the average. A 20-ct. decline in the average price of rice would reduce labor earning approximately 30 per cent below that for 1929. Acreage in rice was the chief factor in determining volume of business and labor income. Yield per acre was significant within size groups, but secondary between such groups. There was a direct association between relative labor income and addition to income from livestock.

Tractors and trucks on Louisiana rice farms, 1929, R. J. SAVILLE and G. H. REUSS (*Louisiana Stas. Bul. 218 (1930), pp. 39*).—The results of a study made in 1929 are reported, the data having been obtained from 124 rice farmers in Acadia and Jefferson Davis Parishes, of whom 115 were using 181 tractors.

Tables are included and discussed showing by make and size of tractor the distribution, age, average acreage handled, average number of hours of work of different kinds, operating and overhead costs, and average labor income; and by farms grouped on the basis of acreage in rice, the type of tractor used, number and size of motor trucks, estimated cost of road hauling of different kinds at contract rates, items of outlay in operating automobiles and Ford trucks, and outlay and accomplishment for work stock. Other tables show for the individual farms the type of tractor used, hours used, and costs for different items, and the labor requirements per 100 acres of rice for different operations with teams only and with different types of tractors.

Financing production and marketing of Louisiana strawberries and suggested reorganization, R. L. THOMPSON (*Louisiana Stas. Bul. 219 (1931), pp. 67, figs. 7*).—The development of the strawberry industry in Louisiana, methods of financing the industry, cost of credit, the local associations and their charges for different services, central selling agencies, variations in prices at different local shipping points, central market prices and the differences between such prices and auction prices, the relationship of prices of type of cars used, and the defects in handling berries through marketing channels are discussed. Findings were made and conclusions reached as follows:

There are too many local associations and the costs are out of proportion to the services rendered. Costs of marketing service, mercantile service, and credit are out of line with the income and services received. Credit from the associations cost farmers a flat rate of 10.47 per cent, or a term rate of 15.69 per cent. Some of the associations paid more than 16 per cent for money used by members. The rate on merchant credit in 1928 averaged 18 per cent. Material savings in the cost of credit and supplies can be brought about by

efficient cooperative action. The present system of handling the crop is not conducive to large gains for any of the agencies involved. Type of car used affected prices received, the average prices received for berries loaded in long refrigerator cars being from 1 to 33 cts. per crate higher on 28 days between April 1 and May 16, 1930, than were the prices of berries loaded in short cars. On 8 days the prices received for berries in short cars were the higher by from 1 to 8 cents. The findings do not confirm the conclusion that buyers voluntarily control the price on the Hammon auction. No high correlation was found between type of car and the claims coming back on the auction.

It is recommended that existing associations be consolidated or reorganized into single, strong, local cooperative associations at each of the main shipping points; that a central selling organization made up of local cooperative associations be formed to handle all sales and the accounting for the entire organization including the locals, to maintain a credit corporation capable of extending $3,000,000 in credit, and to purchase all supplies, fertilizer, and feed; and that all transactions be put on a cash basis.

A proposed plan for a central agency for marketing Louisiana strawberries, together with forms for articles of incorporation, organization agreement, marketing agreement, and by-laws, is included.

[**Agricultural trade unionism**] (*Die Organisationen Landwirtschaftlicher Arbeiter. Berlin: Enckehaus, 1929, pp. 120*).—This is a German translation of part 3 of the publication previously noted (E. S. R., 59, p. 587).

The country life of the Nation, edited by W. GEE (*Chapel Hill: Univ. N. C. Press, 1930, pp. XV+214*).—Included are the following papers, presented at the round table on this subject at the third session of the Institute of Public Affairs, held at the University of Virginia in August, 1929: Introduction, by W. Gee (pp. IX–XII); The Basis of a Permanently Prosperous Agriculture, by J. E. Boyle (pp. 3–19); Wealth Retention in the Rural South, by C. E. Allred (pp. 20–35); The Extent and Significance of Farm Migration, by L. E. Truesdell (pp. 39–53); The Movement of Farm Population—Its Economic Causes and Consequences, by E. C. Young (pp. 54–75); Farm Group Activities in the South, by E. C. Branson (pp. 79–92); The Eastern Shore of Virginia Produce Exchange, by B. T. Gunter (pp. 93–106); The Farm Family—Its Contribution to the Nation, by F. E. Ward (pp. 109–127); Housing the Farm Family, by J. D. Connor (pp. 128–135); Fundamental Needs of the Country School, by E. W. Knight (pp. 139–152); Social Vision and Rural Education, by F. W. Dunn (pp. 153–159); Little Country Towns and What They May Do for Their Surrounding Trade Areas, by N. LeR. Sims (pp. 163–176); The Opportunity of the Small Town—A Study of Town and Country Relations, by J. H. Kolb (pp. 177–189); and Farmer-Controlled Commodity Marketing Essential to Prosperous Farming, by B. F. Yoakum (pp. 193–209.)

The agricultural policy of France, I–III, R. G. TUGWELL (*Polit. Sci. Quart., 45 (1930), Nos. 2, pp. 214–230; 3, pp. 405–428; 4, pp. 527–547*).—This is a discussion of the agricultural policy of the Government of France since the World War.

The struggle for existence of German agriculture, O. WEISSENBERGER (*Der Existenzkampf der Deutschen Landwirtschaft. Berlin: Wilhelm Christians, 1930, pp. 54*).—The present agricultural situation in Germany, the conditions causing it, and the remedies proposed for improving the situation are discussed.

Chinese farm economy, J. L. BUCK (*Chicago: Univ. Chicago Press, 1930, pp. XII+476, pls. 22, figs. 72*).—This is a study, made by the department of agricultural economics, farm management, and rural sociology of the University of Nanking, of the farm management and rural social conditions on 2,866

farms in 17 localities and 7 provinces of China. The data were obtained through investigators using schedules between April, 1921, and September, 1925, and are analyzed under the following headings: Farm layout and land utilization, the year's farm business, the best size of farm business, farm ownership and tenancy, crops, livestock and fertility maintenance, farm labor, the farm family and population, food consumption, and standard of living. Appendixes include tables showing for each locality and for the 2,866 farms the relation of size of farm to 30 variables, the gross correlation coefficients classified according to size and the gross correlation coefficients of the relation of certain variables with other variables, and total amount of crop hectares devoted to various crops on the farms studied, 1921–1925, and the schedules used in the study.

Chinese rural economy, J. L. Buck (*Jour. Farm Econ., 12 (1930), No. 3, pp. 440–456*).—This is a brief résumé of the study noted above.

International yearbook of agricultural statistics, 1929–30 (*Internatl. Inst. Agr. [Rome], Internatl. Yearbook Agr. Statis., 1929–30, pp. XXXVII+747*).—This is a continuation of the series previously noted (E. S. R., 62, p. 582). Statistics have been added as to the production of eggs and poultry; international trade in cattle, pigs, eggs, and egg derivatives; prices of several commodities; the absolute and relative importance of the argicultural population in various countries and its distribution according to social condition and different branches of agriculture; the distribution of agricultural holdings according to extent and mode of tenure; and forestry. The data are in French and English.

FOODS—HUMAN NUTRITION

How certain methods of cooking affect the quality and palatability of beef, J. A. Cline, E. A. Trowbridge, M. T. Foster, and H. E. Fry (*Missouri Sta. Bul. 293 (1930), pp. 40, figs. 20*).—This publication deals with studies carried on during the past four years as a part of the national cooperative project on factors influencing the quality and palatability of meat. Two problems were considered: (1) Methods of cooking beef and (2) palatability of the less tender cuts. The methods used in roasting included (1) searing at a high temperature for a short time and cooking to the desired degree of doneness at a lower temperature and (2) cooking to the desired degree of doneness at a constant temperature, five variations of each method being used.

As has been noted in progress reports on the roasting experiments (E. S. R., 63, p. 788), searing was found to increase the cooking losses. Low oven temperatures were considered superior to high in that the cooking losses were less, the degree of doneness was more uniform, and the roasts were more juicy and tender. The time per pound required for roasting was less at the higher oven temperatures. A low internal temperature of a roast at the time it was put in the oven increased the cooking losses and the time of cooking. Roasts cooked with the addition of water were less palatable and had greater cooking losses than with no water added. Cooking losses were greater when the roasts were cooked to the well-done stage. The cooking time required per pound varied inversely with the size of the roast, but considering the various cuts as a group, other factors than mere size appeared to affect the cooking time and cooking losses. Boneless roasts required more time per pound than roasts with bone. It is thought that the doneness of a roast can be determined accurately only by the use of a meat thermometer on account of the various factors influencing the length of time per pound.

The larger steaks (sirloin and round) required less time per pound to broil than the smaller ones, and the smaller ones a shorter time than the larger ones

of the same thickness. It is considered that the doneness of a steak as well as of a roast can be determined accurately with the meat thermometer placed horizontally in the steak, but can also be timed fairly accurately. A timetable is given for broiling 2-in. steaks medium done.

In the studies with the less tender cuts, comparisons were made of prime rib, first and second ribs of chuck, sirloin tip, rump, and heel of round roasts cooked at constant temperatures of 125 and 165° C., and of rib, porterhouse, sirloin, and round steaks cut 2 in. thick, placed on a broiler preheated at 260°, and cooked to an internal temperature of 57°.

In the roasts fairly palatable products were secured with even the less tender cuts. The heel of round and rump roasts were the least tender and the sirloin tip, prime rib, and third, fourth, and fifth ribs the most tender, no marked differences being found for any of these three cuts. Of the steaks, the tenderloin muscle was the most tender and a muscle from the bottom round the least tender. Some of the steaks were cooked on a gas and some on an electric broiler. The gas broiler was considered to give slightly less tender but more juicy steaks than the electric broiler. "Ease of manipulation seemed to be the main point in favor of the gas broiler, as the palatability grades were very close for the two methods, using the same cut."

The tabulated data for the various experiments are assembled in an appendix.

Standards for cooking vegetables in the electric oven, Ven. W. Swartz (*Washington Col. Sta. Bul. 245 (1930), pp. 39, 40*).—In the selection of utensils for use in establishing standards for cooking vegetables in the electric oven, 17 utensils of six different materials were tested for their relative efficiency in terms of the length of time required to heat a definite amount of water under certain conditions. Of the various materials, cast iron was the most efficient, glass, china, and enamel ware next, and aluminum and stainless steel least efficient. It required 27 minutes to heat the given amount of water in the cast-iron utensils and 54 minutes the same amount of water in the aluminum utensils.

Samples of water from 19 different localities in 13 counties of the State were tested for alkalinity. All except 5 of the samples were alkaline, and only 1 was definitely acid. After a minute of boiling all but 1 of the samples had pH values of 8 or beyond. This value is considered satisfactory for a cooking water, as it is sufficiently alkaline to maintain the green color of the vegetables.

The Vicat needle, which has been used in some laboratories as a penetrometer for testing doneness in vegetables, was discarded because it proved incapable of fine adjustment of weight and because of lack of uniformity of vegetable samples. "Even in such a homogeneous vegetable as the Irish potato, there is such a wide variation in firmness from piece to piece in the same potato, and between tubers, that the results are vitiated. It is plainly not applicable to such vegetables as spinach and celery."

Conservation of iron in vegetables through methods of preparation and cookery, O. Sheets and E. Frazier (*Mississippi Sta. Rpt. 1930, p. 22*).—In this progress report a summary is given of the losses of iron from the various vegetables listed in the previous report (E. S. R., 64, p. 493) when cooked in different ways. With each method of cooking samples were cooked until considered sufficiently tender and other samples the maximum length of time reported as being customary in the State. The methods followed and losses in iron are summarized as follows: Cooking in a large amount of water a maximum time 9 to 29 per cent, cooking in a large amount of water a minimum time 9 to 26.8, cooking in a small amount of water a minimum time 7 to 17,

steaming in minimum time 4.5 to 10, and cooking in a pressure cooker a minimum time 2.6 to 6.8 per cent.

Separate analyses of stalks and leafy portions of mature mustard, turnip, and collard greens showed that the leafy portions contained from 4 to 7 times as much iron as the stalks.

Variation in iron content of vegetables, O. SHEETS and A. SULZBY (*Mississippi Sta. Rpt. 1930, pp. 24, 25*).—In this progress report (E. S. R., 64, p. 493) it is noted that the outside green leaves of cabbage, whether grown in the greenhouse or out of doors, were found to contain from 35 to 100 per cent more iron than the inside blanched leaves of the same heads. Cabbage grown in beds contained almost twice as much iron as when grown in the same soil in pots.

Food poisoning probably caused by orange colored staphylococcus from udders of apparently healthy cows, R. J. RAMSEY and P. H. TRACY (*Soc. Expt. Biol. and Med. Proc., 28 (1931), No. 4, pp. 390, 391*).—During the course of an investigation of the cause of a malt flavor in raw milk, one of the authors developed severe gastroenteritis following the ingestion of raw milk which had been inoculated with a pure culture of an orange colored staphylococcus isolated from a sample of milk delivered to a commercial milk plant. That the staphylococcus was responsible for the attack was verified by feeding experiments conducted on kittens. Attention is called to the reports of Jordan and of Dack et al. on an epidemic of food poisoning traced to a similar organism (E. S. R., 63, pp. 891, 892). In the present instance the organism is thought to be *Staphylococcus aureus*.

Foods used by rural families in Ohio, H. McKAY and M. A. BROWN (*Ohio Sta. Bul. 470 (1931), pp. 193, 194*).—The food consumption studies reported in detail for the year 1926 (E. S. R., 61, p. 585) were continued through the years 1927 and 1928, the total number of records from household accounts books secured being 47 for 1926, 68 for 1927, and 67 for 1928. Complete records for the three consecutive years were obtained from 18 families.

To determine the trends in food expenditures from year to year, the average expenditure for each of the principal food groups each year were tabulated in percentages of the total cost. The values by groups were meat, eggs, and fish 26, 32, and 32; milk and cream 16, 16, and 16; fruit and vegetables 26, 20, and 19; bread and cereals 11, 12, and 12; and fats, sugars, and other foods 22, 21, and 23 per cent of the total expenditures for the three consecutive years, respectively. These figures show a remarkable constancy from year to year for all groups except the meat, eggs, and fish group and the fruit and vegetables group. These two groups together made up slightly more than half of the food budget and as the percentage of one decreased that of the other increased.

A comparison with accepted standards of the nutritive value of the individual diets of the 18 families keeping records for the three years showed, as was true of the first year's records, that more diets were inadequate in iron than in any other factor. Forty-six per cent of the diets were inadequate in iron, 37 in calories, 35 in phosphorus, 16 in calcium, and 9 per cent in protein. The diets which were adequate in all factors averaged higher in cost than those which were inadequate in one or more factors.

A study of living conditions of boarding students in agricultural high schools of Mississippi.—I, Food consumption and expenditures, D. DICKINS (*Mississippi Sta. Rpt. 1930, p. 23*).—In this investigation menus served for three consecutive days were secured from the boarding students in all of the agricultural high schools of the State. These were rated and arranged in three groups according to adequacy and from each group two schools were selected for a quantitative study of food consumption by means of records of actual food

consumption for a limited period of time of a small group of boys and another of girls in each of the schools selected. In one school of each adequacy group the subjects were selected from the 15-, 16-, and 17-year students and in the other from those 18 and 19 years of age.

A brief summary is given in this progress report of the analyses of four of the diets. In the two groups which can be compared as of the same age (15, 16, and 17 years) and sex (girls), but from schools presumably furnishing better and poorer diets, respectively, the values for energy, phosphorus, and cost were higher in the first group, but protein, calcium, and iron somewhat lower. The average money value per child per day was 30 cts. for the presumably better diet and 19 cts. for the poorer. In comparison with the latter figure the diets of the boys of the same age group and same class menu cost 29 cts. a day.

Seasonal variations in the rate of growth of preschool children, H. McKay and M. A. Brown (*Ohio Sta. Bul. 470 (1931), pp. 194, 195*).—This study, noted in previous progress reports (E. S. R., 63, p. 90), has been completed with records for the third year of 48 children. Of these, 61 per cent made or exceeded the expected yearly gains in weight and 73 per cent in height. As in the preceding years, the gains in weight were greater in the summer period, May to October, than in the winter period, November to April, the average gains being 0.47 and 0.31 lb., respectively. The gains in height during the two seasons were the same, 0.21 in., although in the preceding years the gains in height, as well as in weight, were greater in the summer than in the winter season.

Cost of health maintenance of young children (*New York Cornell Sta. Rpt. 1930, p. 107*).—In this study, "the average expenditure per person was highest for families with one child; it was higher for underweight than for normal children; it tended to be reduced by the use of certain health measures; it was spent largely for curative rather than for preventive measures; and the amount spent would have made possible at least monthly office examinations by physicians, which, with ordinary care in home routine and public exposure of children, would have greatly reduced the possibility of much of the illness."

***Hemoglobin and blood picture of children of the nursery school at* different seasons and under varying conditions** (*New York Cornell Sta. Rpt. 1930, p. 107*).—In this progress report of a study planned to extend over several years, it is noted that in a previous year the hemoglobin readings for a group of nursery school children showed a marked drop between winter and spring readings and that there was slight variability in the red and white blood counts. In a repetition of this work, hemoglobin estimates and red blood counts made five times between December 1 and May 26 on a group of 16 nursery school children showed a continuous increase in hemoglobin from 73 per cent on December 1 to 82.2 per cent in May, the greatest increase (7.0 per cent) being between March and April. The red blood counts again varied slightly and inconsistently.

Fat metabolism (*New York Cornell Sta. Rpt. 1930, p. 105*).—In this progress report on the investigation of the rate of digestion of fats, as determined by the chylomicrons of the blood (E. S. R., 64, p. 194), it is noted briefly without experimental data that no constant relationship has been observed between the chylomicron count and total lipids of the blood plasma in the seven dogs used in the experiment.

[Vitamin studies] (*South Dakota Sta. Rpt. 1930, pp. 19, 20*).—In this progress report it is noted briefly that raw spinach protected guinea pigs against scurvy in 1-gm. daily amounts, that raw Swiss chard was very low in vitamin

C, and that commercially canned asparagus was as rich in vitamin C as commercially canned spinach. Both white and green varieties were used, but no appreciable difference was noted in their vitamin C content. The juice of each was practically as rich in C as the stalk.

In the experiments with Swiss chard, the leaves were separated from the white stem and ribs and fed separately. Although the guinea pigs appeared to relish the stems and the ribs more than the leaves, those on the leaves seemed to make better gains and show fewer indications of scurvy than those on the white stems and ribs. Analyses of the two portions are reported as follows: Green leaf, moisture 86.56; ash, 2.32; and organic matter, 11.12 per cent; and white stem and rib 91.37, 1.37, and 7.26 per cent, respectively.

Studies on the vitamin-B complex, C. H. Hunt, R. M. Bethke, and W. Wilder (*Ohio Sta. Bul. 470 (1931), p. 192*).—In this progress report the conclusions of the authors concerning the number and nature of the substances composing the vitamin B complex are summarized as follows:

"It has been established with considerable certainty that the vitamin B complex is composed of three factors, or vitamins. They are called vitamins B, G, and a provisional 'growth' vitamin. These have been differentiated and the properties of each studied. Vitamin B prevents polyneuritis and is very unstable when heated in either an acid or alkaline medium; vitamin G prevents pellagra (possibly the growth factor is necessary also) and is very stable under all conditions which would likely be met in its separation; while the 'growth' factor or vitamin is unstable when heated in an alkaline medium (pH 9), but stable in an acid medium (pH 5–3.5). Yeast has been found to contain all three factors or vitamins. The wheat grain is rich in vitamin B, but contains very little G, and a fair amount of the 'growth' factor. Molasses contains only a fair amount of the 'growth' factor and is without measurable amounts of vitamins B and G."

Silica gel is said to adsorb vitamin B, but not the growth and antipellagric factors in yeast, while fuller's earth adsorbs these factors to a considerable extent, as well as vitamin B. Excessive washing with distilled water and 80 per cent alcohol fails to remove an appreciable amount of any of the factors from the adsorbing agents.

The anti-pellagra and anti-beriberi vitamins in two varieties of apples, Baldwin and Northern Spy (*New York Cornell Sta. Rpt. 1930, p. 105*).—A study of the relative amounts of vitamins B_1 and B_2 in Baldwin and Northern Spy apples grown in experimental orchards under the same conditions of climate and soil, picked at the same maturity, and stored under identical conditions indicated that the two varieties have approximately the same content of vitamin B_1, and that the differences in the content of the vitamin B complex previously noted were due to variations in the content of vitamin B_2.

The relative values of cod liver oils from various sources, J. C. Drummond and T. P. Hilditch (*[Gt. Brit.] Empire Marketing Bd. [Pub.] 35 (1930), pp. 129, pl. 1, figs. 5*).—This is the complete report of an extensive investigation undertaken under the auspices of the Empire Marketing Board of Great Britain on the composition, manufacture, and medicinal value of cod-liver oil. The report includes a critical discussion of the methods of determining the vitamin A and D content of cod-liver oil; summaries of the color, free acidity, mean saponification value, iodine value, and content of vitamins A and D in fresh liver oils of cod and other fish obtained in various localities in Newfoundland, Scotland, Iceland, and Norway, together with more detailed analyses of certain typical oils; a discussion of the biological factors affecting the vitamin content of cod-liver oils; a detailed report of the investigation of factors involved in the technical preparation of medicinal cod-liver oil; a brief report of cod-

liver oil manufacture in Newfoundland; and specifications for cod-liver oils for medicinal use and for animal feeding.

The methods followed in testing for vitamins A and D and many of the results obtained have been noted previously from other sources (E. S. R., 62, p. 208; 63, p. 9; 64, p, 113; 64, p. 291). Of the oils from the important cod areas studied, those from Newfoundland were found to be of highest vitamin potency, followed in decreasing order by those from Iceland, Scotland, and Norway. The richest oils were obtained in areas where the food supplies for the fish were abundant and at seasons when the oil content of the livers tended to be low.

The standards suggested for cod-liver oil for human use are as follows: Color measured in a 1-in. cell, yellow Lovibond units not greater than 10 and red units not greater than 0.5; free acidity not greater than 0.5 per cent calculated as oleic acid; nonsaponifiable matter not greater than 1.5 per cent; and vitamin A color reaction preferably greater than 7 blue units when measured at a 10 per cent dilution according to the technic described. The standards recommended for cod-liver oil for administration to farm stock are the same for nonsaponifiable matter and vitamin A, and only slightly higher for color (not more than 15 units of yellow and 1 of red) and free acidity (not more than 1 per cent). "There is scarcely any doubt that the use of dark-colored oils of high acidity in the feeding of farm animals is to be deprecated. These oils are naturally more prone to affect adversely the flavor of meat than those of higher grade, and there is an accumulation of evidence to show that they may be definitely toxic."

Experiments on the growth-promoting properties of carotinoids [trans. title], M. RYDBOM (*Biochem. Ztschr., 227 (1930), No. 4–6, pp. 482–487, fig. 1*).—Resumption of growth in young rats in which growth had ceased on a vitamin A-deficient diet is reported following the intramuscular injection of 0.06 mg. daily of carotene in peanut oil solution. On autopsy after 8 weeks on this treatment some unchanged carotene could be detected in the muscles.

Sauerkraut as a vitamin C carrier [trans. title], B. A. LAWROW and N. JAKUSSOWA (*Biochem. Ztschr., 229 (1930), No. 1–3, pp. 115–127, figs. 8*).—For guinea pigs on a basal diet of oats and autoclaved hay (1 hour at 120° C.), the prophylactic dose of sauerkraut juice was established at 30 cc., indicating an antiscorbutic activity of from 5 to 10 per cent of that of orange juice. Calculated in units per kilogram, the sauerkraut juice contained 33 units and sauerkraut 26 units as compared with from 330 to 660 units for orange juice and from 11 to 15 for raw cow's milk.

The effect of feeding green leafy vegetables on nutritional anemia as compared with feeding liver, O. SHEETS, E. FRAZIER, and A. SULZBY (*Mississippi Sta. Rpt. 1930, pp. 23, 24*).—Preliminary experiments are reported on the effectiveness of mustard greens, turnip greens, and collards in regenerating hemoglobin in rats rendered anemic by milk feeding. The materials were fed in the dried ground form in amounts furnishing 0.5 mg. of iron per rat per day in the case of mustard and turnip greens. The animals fed collards refused to take more than enough to give a level of 0.27 mg per day. In the animals receiving turnip greens the hemoglobin level rose from an average of 5.9 gm. per 100 cc. at the beginning of the experiment to 10.9 gm. after 3 or 4 weeks, in those receiving mustard greens from 4.9 to 9.4 gm. in 5 weeks, and in those receiving the smaller amount of collards from 3.3 to 6.3 gm. in 5 weeks and to between 9 and 10 gm. in 14 weeks.

The effect of feeding sorghum and ribbon cane syrup on nutritional anemia, E. FRAZIER and O. SHEETS (*Mississippi Sta. Rpt. 1930, p. 24*).—Samples of four varieties of sorghum sirup and of one variety of ribbon cane sirup col-

lected from several mills were analyzed for iron by the Kennedy method (E. S. R., 62, p. 111), with minimum, maximum, and average values for the sorghum sirup of 0.0103705, 0.022692, and 0.010234 per cent, respectively, and an average value for the cane sirup of 0.010657 per cent.

When sorghum sirup was fed to anemic rats at an iron intake level of 0.5 mg. daily, the hemoglobin level was raised from an initial value of 4.8 to 12.8 gm. per 100 cc. in 8 weeks. In others fed the sirup at a level of 0.25 mg. of iron daily, the hemoglobin was raised from 4.5 to 7.2 gm. per 100 cc. in the same length of time.

TEXTILES AND CLOTHING

Oils and fats in the textile industry, W. Herbig (*Die Öle und Fette in der Textilindustrie. Suttgart: Wiss. Verlagsgesell., 1929, 2. ed., pp. VIII+451, figs. [46]*).—The six main headings of this monograph are (1) fats, oils, and the varieties of waxes, (2) analytical methods for fats and oils, (3) textile soaps and washing materials, (4) analysis and testing of textile soaps, (5) textile oils, and (6) analysis and testing of Turkey red oil and of the newer textile oils.

The influence of laundering and exposure to light upon some washable silks, M. Griffith (*Ohio Sta. Bul. 470 (1931), pp. 195, 196*).—In this study of 14 silk fabrics ranging in price from $1 to $3.98 per yard, "the results show that there is fading due both to laundering and exposure to light in all the colors of all the silks, and that the various colors in the different silks show similar results as to fading. The blue and green show the most fading in both laundering and exposure to light, while the peach and yellow are the least affected. The breaking and bursting strength of the new fabrics indicate that the strength of the silk varies directly with the price, the higher priced silks being the strongest. The wild silks are not as strong as the mulberry silks, and the weighted mulberry silks are not as strong as the pure-dye mulberry silks."

HOME MANAGEMENT AND EQUIPMENT

Efficiency of the home laundry plant, E. H. Roberts (*Washington Col. Sta. Bul. 245 (1930), pp. 38, 39*).—As a result of over 90 experimental washings in the laboratory and another series in homes, various types of washing machines have been arranged as follows in order of speed of cleaning: (1) Agitators, (2) vacuum cups, (3) cylinders, and (4) oscillators.

Energy metabolism studies, using the Benedict knapsack equipment, were conducted while ironing in different ways. The results thus far obtained show an increase of 40 per cent above the basal metabolic rate for ironing sitting at an ironer, 75 per cent for ironing with an electric iron while sitting, 95 per cent for ironing with an electric iron while standing, and 105 per cent for ironing with sadirons involving trips to the stove. Records of the use of an ironer in two homes, as well as in laboratory tests, showed a considerable saving in time in ironing a number of pieces as compared with the use of a hand iron and with an electrical expenditure of approximately 1.1 kw. per hour, only twice that of the flatiron.

MISCELLANEOUS

Dedication of Atwater Laboratory, June 12, 1930 (*Connecticut Storrs Sta. Bul. 168 (1930), pp. 205–231, pls. 2*).—The papers given at this dedication (E. S. R., 63, p. 198) are presented, as follows: The Laboratory, by W. L. Slate (pp. 209, 210); Wilbur Olin Atwater, by E. C. Schneider (pp. 211–218); The Research Work of the Storrs Station on Animal Diseases, by E. H. Jenkins (pp. 219–224); and Genetics at Storrs, by A. F. Blakeslee (pp. 225–231).

Annual report of the director for the fiscal year ending June 30, 1930, C. A. McCue et al. (*Delaware Sta. Bul. 167 (1930), pp. 52, figs. 6*).—This contains the organization list, a report of the director including a financial statement for the fiscal year ended June 30, 1930, and departmental reports. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Tenth Annual Report [of Georgia Coastal Plain Station], 1929, S. H. Starr (*Georgia Coastal Plain Sta. Bul. 12 (1930), pp. 59, fig. 1*).—This contains the organization list and a report of the director on the work of the station. The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-third Annual Report [of Mississippi Station], 1930, J. R. Ricks et al. (*Mississippi Sta. Rpt. 1930, pp. 49, fig. 1*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1930, and departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue.

Forty-third Annual Report [of New York Cornell Station], 1930, A. R. Mann (*New York Cornell Sta. Rpt. 1930, pp. 125*).—This contains a summary of the progress on the more important research projects of the station during the year 1929–30, together with references to the publications of the year. The experimental work reported not previously noted is abstracted elsewhere in this issue.

Forty-ninth Annual Report of [Ohio Station], 1930, C. G. Williams et al. (*Ohio Sta. Bul. 470 (1931), pp. 270, figs. 66*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1930, and a report of the director summarizing the work of the station during the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Forty-third Annual Report of the South Carolina Experiment Station, [1930], H. W. Barre et al. (*South Carolina Sta. Rpt. 1930, pp. 139, figs. 43*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1930, and a report of the work of the station during the year. The experimental features reported not previously noted are for the most part abstracted elsewhere in this issue.

Annual Report of [South Dakota Station, 1930], J. W. Wilson (*South Dakota Sta. Rpt. 1930, pp. [2]+35*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1930, and departmental reports on the work of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

A decade of crop yields from Vivian Farm, A. N. Hume (*South Dakota Sta. Bul. 253 (1930), pp. 36, figs. 13*).—The experimental work reported is for the most part abstracted elsewhere in this issue. Rainfall data are included.

Fortieth Annual Report [of Washington College Station], 1930, E. C. Johnson et al. (*Washington Col. Sta. Bul. 245 (1930), pp. 77*).—This contains the organization list, a report on the work of the station, and a financial statement for the fiscal year ended June 30, 1930. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of the Western Washington Experiment Station, [1930], J. W. Kalkus et al. (*Western Washington Sta. Bul. 18–W (1930), pp. 44, pl. 1, figs. 2*).—This contains the organization list, a report by the superintendent, departmental reports, and a financial statement for the fiscal year ended March 31, 1930. The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

NOTES

California University and Station.—Stanley E. Flanders, parasite collector in the division of beneficial insects at the Citrus Substation, left for Australia in January to be gone for approximately one year. The primary purpose of his trip is to determine, if possible, the country of origin of the citricola scale. It is well known that this scale is not native to California, but outside of that State it has been recorded only in Japan, where it is also considered an introduced species. From the fact that it thrives only in arid regions and is practically limited to citrus as a host, there has been a theory that it may have originated in some arid part of Australia. The obtaining of parasites from its native home which would keep it in check would be of great importance to the citrus industry of the State.

Dr. William A. Lippincott, professor of poultry husbandry at Davis since 1923, died January 5 at the age of 48 years. He had previously been assistant professor of animal husbandry in charge of poultry work at the Iowa College and Station in 1911-12 and professor of poultry husbandry in the Kansas College and Station from 1912 to 1923. He was a native of Illinois, a graduate of Illinois College in 1903 and of the Iowa College in 1911, and had received the M. S. and Ph. D. degrees from the University of Wisconsin in 1917 and 1920, respectively. He had been secretary of the International Association of Poultry Instructors and Investigators and was the author of Poultry Production, published in 1914.

Iowa College.—Anna E. Richardson, dean of the division of home economics from 1923 to 1926 and subsequently in charge of the child welfare study work of the American Home Economics Association, died February 3. Miss Richardson was a native of North Carolina and had served as a member of the teaching staff of the University of Texas and as supervisor of vocational education in the South and West for the Federal Board for Vocational Education. She was widely known among home economics workers.

Kansas College and Station.—On March 5 a bill was approved by the governor under which the name of the institution has been changed from Kansas State Agricultural College to Kansas State College of Agriculture and Applied Science. According to a note in the *Kansas Industrialist*, this change was sought to forestall possible confusion following a request from the Kansas State Teachers College for redesignation as Kansas State College, and does not involve any change in the aims, character, or work of the institution.

The State appropriations for the ensuing biennium aggregate $2,751,582, an increase of $179,500. Much of this increase was for research, the allotment for studies in animal diseases being increased from $20,000 to $40,000, that for soil and crop experiment fields from $12,000 to $44,000 to extend the work from the southeastern to the south-central and northeastern parts of the State, and that for the substations from $106,500 to $120,000. New items include $60,000 for a dairy barn and experimental plant, $20,000 to complete the equipment of the college library, and $25,000 to modernize the college radio station KSAC and increase its power from 500 to 1,000 watts. Items continued with-

out change include salaries and wages $1,362,900, maintenance $700,000, extension work $203,682, laboratory equipment $40,000, and the soil survey $10,000.

Harry E. Reed, professor of animal husbandry and investigator in cattle husbandry, has resigned to accept a position in the foreign service of the U. S. D. A. Bureau of Agricultural Economics, and will be succeeded on July 1 by A. D. Weber, associate professor in the University of Nebraska and in charge of sheep investigations at the Nebraska Station.

New York State Station.—The station budget for the fiscal year 1931–32 carries a total of $503,480. This is an increase of $126,655, of which $80,000 is for new greenhouse equipment, $10,000 for additional studies of the utilization of fruit and vegetable by-products, $9,000 for seed investigations, and $5,000 for studies of legume inoculants.

Dr. E. E. Clayton, since 1922 plant pathologist at the Long Island Vegetable Research Farm at Riverhead, has resigned, effective April 1, to become plant pathologist in the office of tobacco investigations of the U. S. D. A. Bureau of Plant Industry.

North Dakota College and Station.—G. J. Baker, professor and assistant chairman of animal husbandry work in the station, has been transferred as extension specialist in animal husbandry. R. C. Miller, agricultural engineer, has resigned to accept a similar position at the Ohio State University. Harold Seielstad, assistant in farm management, has resigned to engage in commercial work. Peter J. Olson, assistant agronomist, has been granted leave of absence for one year beginning February 1 for advanced study at the University of Nebraska.

Vermont University.—Dr. Thomas Bradlee, director of the agricultural extension service since its establishment in 1913, died February 21 at the age of 45 years. He was a native of New York State and graduated from Cornell University in 1911.

Office of Experiment Stations.—R. W. Trullinger, assistant in experiment station administration, senior agricultural engineer, and in charge of the section of agricultural engineering of *Experiment Station Record*, has been appointed a member of the administrative board of the American Engineering Council, a member of its committee on research programs, and chairman of its committee on reforestation. He is the representative on the council of the American Society of Agricultural Engineers, of which he is also president.

The American Engineering Council, which is the central coordinating agency of the leading national, regional, and State engineering and technical societies, has evinced considerable interest in the economic and engineering problems of agriculture, and the committees on research and reforestation are among the most active in that connection.

New Journals.—*Annali della Sperimentazione Agraria* is being published at Rome by the Foundation for Experimentation and Agricultural Research of the Ministry of Agriculture and Forestry. The initial number contains the following articles: Guide to Agricultural Experimentation (pp. 1–139) and The Experimental and Demonstration Field (pp. 141–165), both by U. Pratolongo; Method for Determining Organic Matter in Soils, by L. U. de Nardo (pp. 167–240); The Determination of Organic Matter in Soils by Means of Various Sulfur and Chromium Compounds, by G. Leoncini (pp. 241–246); and The Action of Kosseir Phosphate in Neutral Soils, by F. Scurti and G. Piano (pp. 247–264).

L'Agriculture Pratique des Pays Chauds, a monthly review of tropical agriculture discontinued by the World War, is being issued in a new series published under the direction of Georges Wery at 184 Boulevard Saint-Germain, Paris. The original articles in the initial issue include The Tombak Tobaccos

of *Syria and Persia*, by H. Jumelle (pp. 7–18); The Restoration and Maintenance of the Ranges in Stock-Raising Countries, by H. Velu (pp. 19–31); The Conditions of Agricultural Production in Madagascar, by J. Adam (pp. 32–42); Land Clearing, by M. Ringelmann (pp. 43–52); and The Agricultural Competition of the Colonies, by C. Legras (pp. 53–60).

The Journal of the Maryland Academy of Sciences is being issued quarterly by the academy at Baltimore, Md. The initial number includes a paper entitled The Biological Significance of Aluminum, by O. S. Rask and E. V. McCollum (pp. 38–42). The second issue includes a discussion entitled The Structure of the Atmosphere and Aviation, by W. J. Humphreys (pp. 65–83); Man and Insects, by L. O. Howard (pp. 84–89); and The Formative Effect of Day Length on Wheat Seedlings, by A. M. Hurd-Karrer (pp. 115–126).

Bulletin Agricole de la Martinique is being published as a new series at Fort-de-France by the Service of Agriculture of Martinique. In addition to an editorial on The Service of Agriculture and Cane Sugar, by E. Bassières (pp. 1–11), official decrees and similar material, and meteorological and other data, the initial number contains an article entitled Notes on the Banana Problem, by D. Kervegant (pp. 12–22).

Anales del Instituto de Biologia is being issued by the director of the Institute of Biology of the National University of Mexico. The initial number contains, among others, articles entitled The Cacti of Tehuacan, by H. Bravo (pp. 87–124); The Nervation of the Pancreas, by I. Ochoterena (pp. 125–133); The Argasidae of Mexico, by C. C. Hoffmann (pp. 135–164); and New Cacti of Mexico, by J. Gonzales Ortega (pp. 177–180).

O Campo is being published at Rio de Janeiro, Brazil. The initial number contains many short articles covering a wide range of agricultural information, together with official notices, notes, etc. Among them is a bibliography of the orange and other citrus fruits.

Mitteilungen aus Forstwirtschaft und Forstwissenschaft is being published quarterly by the Prussian Ministry of Agriculture, Lands, and Forests at Hanover. The initial number consists of a monograph entitled Investigation of Humus and Soil Acidity, by Heuell.

Mitteilungen der Deutschen Entomologischen Gesellschaft, E. V., is being published monthly (except July and August) by the German Entomological Society at Berlin. The initial number contained a variety of brief articles and notes.

Miscellaneous.—A prize offered in 1928 as the result of action taken by the International Conference for Phytopathology and Economic Entomology for the best memoir concerning investigations of rust diseases of cereals has been awarded to J. H. Craigie, senior plant pathologist in charge of the Dominion Rust Research Laboratory at Winnipeg, Manitoba.

Dr. Frederick J. Kelly, president of the University of Idaho from 1928 to 1930, and subsequently professor of higher education at the University of Chicago, has been appointed chief of the section of colleges and professional schools, Office of Education, U. S. Department of the Interior, vice Dr. Arthur J. Klein, now professor of school administration at Ohio State University.

The Pan-Pacific Agricultural Conference scheduled for the fall of 1931 has been postponed until 1932 in order to afford further time for preparation and the consideration of plans for organizing a permanent Pan-Pacific Agricultural Association.

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EDITORIAL

INTERNATIONAL COOPERATION IN AGRO-ECOLOGICAL INVESTIGATION

The truism that science knows no national boundaries originated long ago and is often heard to-day. In a recent address at the opening of a new agricultural research station in England, Lord Melchett expressed the essential thought as follows: "One could not confine scientific knowledge to countries or even empires. It is of its very nature and essence world-wide, international, and interchangeable . . . for the benefit of the entire world and of all humanity."

Unfortunately the tacit acceptance of such statements as an enunciation of research ideals by no means signifies that new discoveries straightway receive their widest possible utilization. Seldom, if ever, is there conscious attempt to retard or suppress them, yet even in the immediate vicinity of the point of origin their introduction and adoption into practice is often a matter of years. There are many reasons for this relatively slow extension of knowledge, but not the least is the uncertainty as to the precise conditions under which what has been learned may prove of real advantage.

This is particularly true in the case of new crops or improved strains, consistently favorable reports for which in a single locality usually supply chiefly a promising lead for repeated testing and retesting elsewhere. It is also encountered, however, in other types of experimentation, as was indicated in an address by the former Secretary of Agriculture Jardine in 1916, when in arguing for the necessity of a good deal of repetition he spoke as follows: "Because a certain investigator has determined that the cafeteria system of feeding hogs is the most economical one under certain conditions, it does not necessarily follow, in fact it has been shown, that it is not the most economical method under other conditions. These are so dissimilar even in stations located under apparently similar regions, as for example, the Kansas, Nebraska, and Oklahoma Stations, as to make it almost necessary that the work of each be more or less independent of the work of the other in order to solve the problems most acute in their respective territories. Even within

the State of Kansas it is necessary to try out the results along the lines of most consequence to Kansas farmers in many places."

The limited range of applicability of the traditional variety or fertilizer tests and even of some of the more pretentious breeding and improvement studies was not always realized in the early days of agricultural experimentation. Many comparisons were conducted for years before it was fully comprehended that the experimental plats which had been more or less meticulously laid out were representative of only a restricted portion of the State or other areal unit which they were primarily intended to serve. The establishment of substations, test fields, and the like which often followed was a logical attempt to enlarge the usefulness of the information, but often did little more than supply similar yield data for another area of limited and indefinite dimensions. This was of course of much local benefit, but the fundamental problem of how to interpret the comparisons obtained on the basis of the climatic and cultural conditions under which the crops were grown remained unsolved for the most part, and in consequence the full value of the findings was unrealized.

This condition has obtained generally in experiment stations and similar institutions all over the world, with the result that much time and energy have been given to essentially localized variety and fertilizer tests and their repetition and verification. So great has been the volume of such work and so limited its applicability that it was long ago found impracticable to report such material from foreign institutions in *Experiment Station Record*, or in later years to attempt to do more with the routine tests of the State experiment stations than to insure an index reference by stating that results for the specific crops enumerated are reported in the original publication.

The need of more thoroughgoing and better correlated studies has at length been realized, and the trend is steadily in that direction. A recent plea for cooperation in such efforts which presents some novel features has recently been put forward in the *International Review of Agriculture*, published in Rome by the International Institute of Agriculture. The author is Mr. Basil M. Bensin, who signs himself as formerly senior specialist to the Ministry of Agriculture, Petrograd, Russia, and member of the Agricultural Society of the Czechoslovakian Republic. Writing under the title of Possibilities for International Cooperation in Agro-ecological Investigation, he attempts to show how ecological methods may be applied internationally in a systematic way to agricultural experimental work and especially to field crops and their cultivation.

Under Mr. Bensin's plan, "every field cultivated in agricultural or industrial plants might be considered as an artificial association

of useful plants, in which there usually arise natural associations of wild plants or weeds, which compete unceasingly with the cultivated plants. The botanical characteristics of both and their relationship form one of the objects of the sociological or quantitative agro-ecological analysis of any such field. For the study of a special crop or crop plant the adaptation characteristics shown by the plant in its reaction to conditions of environment and cultivation may with advantage be considered. All the kinds of plant adaptations occurring should be most carefully studied by the agro-ecologist, and the detailed description will form the quantitative agro-ecological analysis of the field."

The main purpose of this agro-ecological research would be, in his opinion, to "discover the effects of cultural methods and implements as employed on the plant association at a certain phase of its development. Up to the present, in experimental agronomy a calculation has been generally made of the yield obtained by the use of certain fertilizers or certain methods of soil preparation; agro-ecological research would on the other hand be incomplete apart from more detailed studies of the reason or cause of the results obtained. The most valuable part of agro-ecological work are the studies of root systems as the part of the plant which is most sensitive to cultivation methods and fertilizers."

In order to make the picture as complete as possible, there would be taken into consideration all the factors which have an influence on the development and success of the crop. These would include the climatic and soil conditions in each distinctive agro-ecological region, or "agrochora." "Agro-ecological investigations will thus be based on data obtained in meteorology, climatology, soil science, and experimental agronomy, with the object of finally obtaining sufficient material for the choice of standard machinery, suitable for the standard varieties, and standard methods of cultivation for a given agrochora."

The agro-ecological analysis of the "chorotypes," or local varieties, would indicate "the character, direction, and limits of plant breeding work. Such analysis of cultivation methods includes all the processes of agricultural technic: Crop rotation, preparation of seed bed, fertilizers used, planting or sowing, cultivation after planting, harvesting. For choice of standard methods, not only should *the optimum yield be taken into consideration*, but *also the economic* possibilities of realizing a practical and remunerative type of farming for the agrochora in question."

Mr. Bensin proposes a new and distinctive terminology for international use in agroecology, and suggests that it is probable that "after the development of agro-ecological investigations throughout

the various countries additional terms would be required for technical descriptions of the most important features of the soil analysis, cultivation methods, types of machines, etc., and for the characteristics of the agrochoras and of the agricultural regions also. The present nomenclature for the classification of the agricultural regions, e. g., arid, semiarid, and humid, based on the quantity of the precipitations is not quite satisfactory; the economic and cultural character of the given agrochora should be indicated more definitely, and in the first instance by the prevailing crop and by the degree of intensity of the farming."

A series of fundamental "choromodular climatic coefficients" is indicated for the bioclimatic characters for each agrochora. These include the average number of days of the growing period for each crop, the average total heat units during this period, the average number of hours of sunshine, and the average precipitation. These coefficients, established in accordance with meteorological and phenological observations made over a period of five years, he believes, would sufficiently characterize the agrochora from the agro-ecological and climatic standpoints. Admitting that at present such data are not available for even the most typical regions of each country, he considers it undoubtedly possible "gradually to obtain these, as the number of meteorological and agricultural experiment stations is everywhere rapidly increasing."

The plan for international cooperation which he sets forth involves two main steps, the collection of available data and the preparation of a standard method for carrying on agro-ecological tests in the future. As a medium for dealing with the highly important matter of standardization in testing, Mr. Bensin suggests a special committee of the International Congress of Agriculture, and he expresses a hope that a beginning may be made at the fifteenth congress of this body, held at Prague during the current month.

The systematic collection of data by the International Institute is proposed with a view to locating the distinctive agrochoras in the different countries and working out the adaptations therein of different crops. As a basis of procedure, the sending out to the member States of a questionnaire which would bring out "all agro-ecological data relating to every crop in every agrochora" is advocated. Thus for maize, the questionnaire would include descriptions of (1) the agricultural regions in which maize is grown, with an indication of the choromodular coefficients and the soils, (2) the chorotypes of each agrochora with the local names and the origin of the varieties employed, (3) the methods of cultivation employed, as in the preparation of the seed bed, fertilizers, and the date and methods of planting, cultivation, and harvesting, and (4) the farm equipment in use from the point of view of its effectiveness and economy of operation.

There would also be obtained the addresses of the experiment stations situated in the respective regions, summaries of their work on maize, the experimental methods followed in their trials of varieties, plant breeding and cultural details, references to the literature published by these stations, lists of private plant breeders in the region, and similar relevant information. On the basis of these data, the institute would compile and publish the following: "(1) A catalogue of the local varieties of maize with an agro-ecological description of each, including a list of the varieties improved by individual farmers or by plant breeders' associations with addresses, (2) summarized data on the methods of cultivation and the farm machines used in all countries growing maize, (3) types of methods used on the experiment stations of each region and results obtained. All such data could be published in a single volume entitled 'Agro-ecology of the Maize Plant'; similar publications could be prepared in the same way for the other crops: Wheat, barley, oats, rye, sugar beet, cotton, etc."

This plan, Mr. Bensin admits, "naturally implies an immense labor on the part of the best scientific agricultural specialists and practical agriculturists of the different countries," but he believes that a gradual realization of the idea might be brought about by international organizations and by "single States of Europe and of America. Undoubtedly the methods of agro-ecological investigations proposed should be adapted in each case and for each kind of crop to local conditions, but the working out of the general plan would be of great service to many thousands of workers in the experiment stations of the whole world."

Whatever may be the degree of ultimate acceptance of so novel and ambitious an undertaking as is thus proposed, it would seem that attempts to utilize it in the near future would be more likely to succeed if begun on a comparatively modest scale. At the present time, many of the data most essential for the determination of the agrochoras are lacking, and without detailed observations of meteorological conditions, soil characteristics, and similar factors, the mere tabulation of comparative yields would seem of doubtful advantage. Despite earnest efforts in many directions, notably those of the International Soils Congress, to arrive at greater uniformity in terminology and standardization of methods, there is still much to be done before an accurate comparison of widely separated regions can be expected from the information at hand. The suggestion may also be ventured that however appealing to the imagination may be the possibility of locating precisely comparable areas for certain crops in Utah and Mongolia, in New England and northern Europe, the factors producing them might be so numerous and

so complex in their interrelationships that the number and size of such areas would be too small to be of practical significance. In most cases the divergencies would perhaps be so great as to entail a protracted series of adaptation tests comparative to the present procedure.

Yet it by no means follows that no improvement can be made in the prevailing methods. Irrespective of the possibilities of long distance utilization of the data, there are good reasons why many of the more empirical comparisons should be rendered more clear-cut and determinative. Seasonal differences may not readily be eliminated, but if yields are supplemented by phenological observations they may largely be explained and correspondingly discounted. Light may be thrown on underlying causes of variations in what Director Thorne has called "that mysterious alchemy, in which the soil, the sunshine, the rain, and the growing plant participate," and more progress thereby made in a single step than in a decade of routine testing.

Fortunately, progress is already being made in this direction. The outstanding work of Azzi in the agricultural ecological service of Italy, and the efforts in Great Britain for systematic phenological observations fostered by the Agricultural Meteorological Committee may again be recalled as recent manifestations abroad of a movement which seems to have considerable promise. The first step in most institutions would seem to be merely a closer cooperation between the several departments most directly concerned to insure both the collection of adequate data and their more comprehensive interpretation. Should the procedure become general, the possibilities of correlation of results would be greatly enhanced and their usefulness correspondingly extended. As Director Lipman said in 1916, "we want to know whether there is such a thing as a soil biological flora, we want to know what available phosphorus or nitrogen may mean as affected by climate rather than by soil composition. There are any number of fundamental problems which can not be understood in all their bearings because we are circumscribed by a rather narrow horizon."

In view of the manifest advantages of a broader outlook, even the international aspects which Mr. Bensin has in mind may be found in some degree to lie within the boundaries of practical achievement. At all events the underlying principle of attempting to obtain a better understanding of environmental conditions, upon which his plan is based, would seem to merit serious consideration. From the standpoint of either immediate or long range objectives, the more complete and intensive study of the environment of the plant and the agencies which control or modify it seems well worth while.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical work, Oklahoma Station] (*Oklahoma Sta. Rpt. 1927–1930, pp. 177, 178, 184, 185*).—The following items are noted:

Storage of vegetables, M. Benoy.—Sun-drying of certain vegetables was found practicable, the dried products giving satisfactory cooking tests.

Changes in the composition of fresh, ripe vegetables held at 30° C. in the dark and at a high humidity indicated "the changes in composition, due to respiration which presumably constitutes a loss of carbohydrates, to be greatest during the first 10 hours after harvesting. . . .

"A comparison of the rate of respiration with the chemical composition of fresh vegetables failed to show a relationship existing between the two."

Chemical analyses of plants.—It was found that "material on which a nitrogen fractionation study is to be made can not be preserved for subsequent analyses in alcohol."

The physical chemistry of the proteins in non-aqueous and mixed solvents.—I, The state of aggregation of certain proteins in urea-water solutions, N. F. Burk and D. M. Greenberg (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 197–238, figs. 9*).—Report is made in a contribution from the University of California Medical School of a method for the determination of the molecular weight of proteins, the procedure being dependent principally "upon the measurement of the osmotic pressure, in an isoelectric condition, of the proteins dissolved in certain organic solvents, particularly [6.66 M] urea-water solutions."

"The osmotic pressure of casein, edestin, and hemoglobin was found to increase to more than is proportional to the increase of concentration. The curves for these proteins can be corrected for this deviation from proportionality by the use of the equation

$$C=\frac{100\,C'}{100-hC'}$$

in which C' is the measured concentration and h is a constant. A value of 2.80 for h was found to make the corrected concentration, C, proportional to the osmotic pressure for all three proteins. If the deviation from proportionality is due to a solvation of the proteins, then 2.80 gm. of solvent per gram of protein are a measure of the solvation.

"From the osmotic pressure measurements in urea solutions, controlled with respect to hydrogen-ion activity and corrected for the deviation from proportionality, the molecular weights of the following proteins were calculated as follows: Casein 33,600±250; edestin 49,500±700; hemoglobin 34,300±425; and egg albumin 36,000.

"The change of solvent has been found to cause a change in the state of aggregation of hemoglobin. Dissolved in urea solution it has half the molecular weight found in water solution. On the other hand the molecular weight of

egg albumin is not changed by the urea. Both hemoglobin and egg albumin are denatured by urea solutions, the hemoglobin being converted to cathemoglobin. Measured in 6.5 M glycerol solution, hemoglobin has the same molecular weight as in aqueous solution. In glycerol solution hemoglobin is not denatured."

"A solution of urea in water as a solvent has a depressing action on the ionization of electrolytes. The apparent dissociation constant pK' of acetic acid is reduced to 5.25 and the pK_2' of phosphoric acid to 7.22."

Mercury derivatives of cysteine, J. C. Andrews and P. D. Wyman (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 427–433*).—In a contribution from the University of Pennsylvania Medical School the authors report a study of the compound formed in the action of mercuric sulfate upon cysteine.

The structure assigned by Vickery and Leavenworth (E. S. R., 63, p. 309) to the compound obtained by them from silver sulfate and cystine corresponded with that considered to represent the mercury compound, of which the make-up "is probably that of a mercury dicysteine containing 2 more atoms of mercury. This hypothesis is supported by other experimental observations, such as the absence of free sulfur from the precipitate obtained when the mercury compound is treated with hydrogen sulfide, the dextrorotatory solutions resulting from the precipitation of *l*-cystine with mercuric sulfate, and the form of the electrode potential curve given by the reaction."

Compound amino acids, S. Miyamoto and C. L. A. Schmidt (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 327–337, figs. 3*).—By means of titration curve determinations the authors of this contribution from the University of California Medical School followed the changes in acidity resulting from the addition of a "predominantly acidic amino acid to a predominantly basic amino acid," and showed that combination to form "compound amino acids" can take place. Also, "methods for the calculation of and data for the hydrolysis constants and ionization constants of certain compound amino acids are presented."

The apparent dissociation constants of diiodotyrosine, its heat of solution, and its apparent heat of ionization, J. B. Dalton, P. L. Kirk, and C. L. A. Schmidt (*Jour. Biol. Chem., 88 (1930), No. 2, pp. 589–600, figs. 3*).—From their estimations of the solubility at various acidities the authors of this contribution from the University of California Medical School determined the apparent acid and basic dissociation constants of diiodotyrosine at 0°, 25°, and 40° C.; and from these data calculated further the apparent heats of ionization of the compound. The heat of solution was determined by estimating the isoelectric solubility at a number of temperatures.

Nitrogenous substances in zinc filtrates of human blood, M. Somogyi (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 339–344*).—Blood filtrates from deproteinization by zinc hydroxide, noted on page 713, were found to contain "substantially smaller quantities of nitrogen than tungstate filtrates."

It is further stated that "the nonprotein nitrogen in zinc filtrates normally varies between 11 and 21 mg. per 100 cc. of human blood, the average being 17 mg. per cent; in cases of nitrogen retention the nonprotein nitrogen is in excess of 21 mg. per cent. Urea shows identical values in zinc and tungstate filtrates, while creatinine is slightly lower and uric acid entirely absent in zinc filtrates. Zinc filtrates, prepared for the determination of true blood sugar, are also adequate for the determination of nonprotein nitrogen, urea, and creatinine."

Factors determining the ergosterol content of yeast.—I, Species, C. E. Bills, O. N. Massengale, and P. S. Prickett (*Jour. Biol. Chem., 87 (1930), No. 2, pp. 259–264*).—The data presented indicate that "different species of yeast, similarly cultured, may differ enormously in ergosterol content. *Saccharomyces logos* contained but a trace, while *S. carlsbergensis* yielded 2 per cent. Different strains of one species, *S. cerevisiae*, ranged from 0.2 to 1.4 per

cent. All yeasts of high ergosterol content grew well in culture, but not all which grew well showed high ergosterol content. In fact, the two most prolific growers, *Mycoderma* sp. and a strain of *S. cerevisiae*, contained a low percentage of ergosterol. In duplicate runs of the same cultures it was observed in 37 out of 53 cases that the runs which gave the heavier yield of yeast also showed the higher percentage of ergosterol." In fine, "the different yeasts exhibit decidedly different capacities for the elaboration of ergosterol, capacities which may be attained or repressed by manipulation of the cultural conditions."

The isomerization of ergosterol with fuller's earth, F. G. McDONALD and C. E. BILLS (*Jour. Biol. Chem.*, *88* (*1930*), *No. 2*, *pp. 601–604*).—Ergosterol in benzene solution was treated with fuller's earth, with the result that the reaction mixture was found to contain an isoergosterol, an alcohol-insoluble substance, a dextrorotatory substance, and resinous decomposition products. "After 10 crystallizations, the isoergosterol exhibited

$$[\alpha]^{24}_{5461} = -37.3°, \epsilon = 13{,}000, \text{ m. p.} = 142°.$$

The acetyl derivative gave

$$[\alpha]^{23}_{5461} = -52.4°, \text{ m. p.} = 149°.$$

Determinations of the iodine value at −5° indicated that the isoergosterol had the same number of double bonds as ergosterol. Rosenheim's color reaction indicated that one of the bonds was the $\Delta^{1,2}$ (or $\Delta^{1,18}$) linkage of ergosterol."

Recent reports of the vitamin activity of carotene [trans. title], M. JAVILLIER and L. EMERIQUE (*Bul. Soc. Chim. Biol.*, *12* (*1930*), *No. 10*, *pp. 1355–1361*, *fig. 1*).—In this review of recent evidence leading to the general acceptance of the vitamin A activity of carotene, a fuller description, with diagram, is given of the method used by the authors in the purification of carotene noted briefly in a previous paper (E. S. R., 64, p. 292).

The variation in colour-test value of commercial samples of cod-liver oil, F. J. DYER and F. WOKES (*Quart. Jour. Pharm. and Pharmacol.*, *3* (*1930*), *No. 3*, *pp. 417–426*).—Twenty-four samples of cod-liver oil purchased in the open market (England) from retailers were examined by the antimony trichloride color test in a Lovibond tintometer under the following conditions: "A cylindrical cell 1 cm. in diameter, 0.2 cc. of a 20 per cent v/v solution of the oil in chloroform mixed with 2 cc. of antimony trichloride reagent, intensity of blue color taken at 30 seconds after mixing."

Individual determinations were made by two observers, and the average of the two results was taken as the color test value of the oil. The values obtained ranged from 3 to 9, with an average of 5.7. In comparison with these values, a series of 16 oils received direct from the importers and found satisfactory in vitamin A content, as determined by feeding experiments, ranged in value from 4.5 to 13, with an average of 8.2. From these relative values it is considered that the consumer of cod-liver oil in England is receiving a product containing on an average only two-thirds of the activity as measured by the color test to be found in satisfactory samples of oil as they enter the country.

Of the 24 samples in the present study, 6 which were stored in amber bottles averaged 6.2 in color values, 17 in white glass bottles averaged 5.6, and 1 in a blue glass bottle 3.5. The use of blue bottles is considered particularly objectionable in that it leads to a false sense of security on account of the well-known protection afforded by amber bottles. On the basis of the findings reported, it is suggested that a satisfactory sample of cod-liver oil should give a color test value of not less than 4 to 5 and that oils giving lower values

should be regarded as of inferior quality. The practice of converting color tests into so-called biological units by the employment of an arbitrary factor is thought unjustifiable if no feeding tests are given in support of such conclusions.

The preparation of the crystalline ovarian hormone from the urine of pregnant women, E. A. DOISY, C. D. VELER, and S. THAYER (*Jour. Biol. Chem.*, *86 (1930), No. 2, pp. 499–509, figs. 3*).—The extraction of the hormone and the purification of the crude extracts are given in experimental detail.

"Seven different solvents have been employed in an attempt to alter the activity of the crystals. One specimen has been recrystallized 20 times. Judged by the appearance and melting point, the final product seems to be a pure substance, and yet the potency remains around 3,000 rat units per milligram. Since, in spite of rigorous attempts to separate the hormone from our crystals this has not been accomplished, we feel that the conclusion that the crystals are the hormone (or at least the potent substance of urine) is justified."

The preparation of the crystalline follicular ovarian hormone: Theelin, C. D. VELER, S. THAYER, and E. A. DOISY (*Jour. Biol. Chem.*, *87 (1930), No. 2, pp. 357–371, figs. 2*).—"A quantity production procedure for the preparation of theelin is described. Essentially the procedure depends upon the fact that theelin, which behaves as a very weak acid, may be extracted from organic solvents with dilute NaOH solutions, and then in turn may be extracted from the alkaline solution by certain organic solvents."

Crystallographic description of theelin, C. B. SLAWSON (*Jour. Biol. Chem.*, *87 (1930), No. 2, pp. 373, 374, figs. 2*).—Examined at the mineralogical laboratory, University of Michigan, a sample of the substance of which the method of preparation is noted above gave, after 20 recrystallizations, full crystallographic data which are here recorded.

The nature of the sugar residue in the hexosemonophosphoric acid of muscle, J. PRYDE and E. T. WATERS (*Biochem. Jour.*, *23 (1929), No. 3, pp. 573–582*).—The authors of this contribution from the Physiology Institute, Cardiff, find that the hexosephosphoric acid of normal muscle press-juice from rabbit, goat, and donkey is a monophosphoric acid. The diphosphoric acid, identical with that of yeast fermentation, was obtained only when the fermentative resynthesis using sodium fluoride was employed. The carbohydrate residue of muscle hexosemonophosphoric acid was found to consist of 90 per cent of aldose, identified as *d*-glucose, and 10 per cent of ketose.

The preparation of d-galacturonic acid from lemon pectic acid, K. P. LINK and A. D. DICKSON (*Jour. Biol. Chem.*, *86 (1930), No. 2, pp. 491–497*).—The authors of this contribution from the Wisconsin Experiment Station show that a convenient source material for the preparation of crystalline *d*-galacturonic acid is lemon pectic acid, which can be obtained commercially. The pectic acid is hydrolyzed in 2.5 per cent sulfuric acid and the galacturonic acid first obtained as its barium salt, with a yield about 42 per cent of the theoretical. The barium galacturonate is converted into the free galacturonic acid by decomposition with 0.1 N sulfuric acid. Precise directions for the preparation of both compounds are given.

Of the effectiveness of the second of the above steps, it is noted that "the yield of pure *d*-galacturonic acid readily obtainable from 10.0 gm. of the barium salt is approximately 2.21 gm., equivalent to 30.5 per cent (theoretical from 10.0 gm. of barium salt is 7.44). By recrystallizing the mother liquors it is possible to increase the yield to 50 per cent."

Oxidation-reduction potentials of certain sulfhydryl compounds, J. W. WILLIAMS and E. M. DRISSEN (*Jour. Biol. Chem.*, *87 (1930), No. 2, pp. 441–451,*

figs. 3).—Cysteine was prepared for the experiments here reported from the University of Wisconsin by the electrolytic reduction of cystine and was found to be oxidized readily by iodine, by potassium iodate, and by potassium dichromate. When so oxidized by titration methods, the curves showing the variation of potential as the oxidation proceeded were typical of the ordinary reversible oxidation-reduction system.

"Calculations of E_0, while checking within the limits of error for each reaction studied, showed somewhat different values for E_0 for each reagent used, indicating a difference in the reaction of cysteine with the various oxidising agents. The values of E_0 were most satisfactory in the lower pH range and showed divergence as the pH increased above 5.3. These results may be considered as evidence for more than one oxidation product of cysteine. . . .

"Finally, it has been suggested that the potentials observed by us depend not only upon the presence of cysteine and hydrogen ions but also upon the presence of an intermediate oxidation product of the cysteine in the solution. This appears to be a natural explanation for the fact that oxidation curves of normal type are obtained when a solution of cysteine is titrated with the common oxidizing solutions. The intermediate oxidation product is sufficiently stable to give reproducible potentials over a period of several hours in the cell which has been used."

The influence of pH and solution concentration on the surface tension of gelatin solutions determined by the sessile bubble method, J. M. Johlin (*Jour. Biol. Chem.*, 87 (1930), No. 2, pp. 319–325, figs. 2).—"The manner in which the surface tension changes with solution concentration indicates that proteins which have been adsorbed at a liquid-gas interface are probably in equilibrium with the bulk of the solution," much as are surface-active substances of low molecular weight. It was shown that a time much longer than is usually allowed is required for apparent surface equilibrium, and that a period in excess of 24 hours is sometimes required for such a condition of equilibrium to be reached, "emphasizing the need of a truly static method for measuring the surface tension of protein solutions."

From pH 5 to pH 9, however, the relative change of surface tension with change in pH was found nearly the same at all stages.

"It has been found that in general the addition of a base increases the surface tension of 1 per cent gelatin solutions, and that the addition of an acid decreases it. A maximum value was found at a pH of 9. The usual minimum previously observed near the isoelectric point and the maximum occurring on the acid side of this point are lacking in the curve representing equilibrium values, although these are found in the curves representing data obtained 1, 2, and 3 hours after the formation of an interface. It is not known to what extent acid hydrolysis is responsible for this deviation."

The effect of partial decay on the alkali solubility of wood, W. G. Campbell and J. Booth (*Biochem. Jour.*, 23 (1929), No. 3, pp. 566–572).—The effect, said to be typical of that of fungi of the brown rot type, of the partial decay of Sitka spruce by *Trametes serialis* was found "of the same order as that produced in the same species of wood by acid hydrolysis," and it is concluded that "decay of the brown rot type should, in effect, be regarded as an acid hydrolysis."

An apparatus for the evaporation of liquids in a test-tube, M. A. Logan (*Jour. Biol. Chem.*, 86 (1930), No. 2, pp. 761–764, figs. 2).—In a contribution from the Harvard Medical School an apparatus and procedure are here reported permitting the evaporation of foaming liquids in 200×20 mm. test tubes.

The device, of which the details are indicated by drawings, consists principally of an air heater through which a gentle air stream is passed over an

electrically heated spiral of nichrome coil. The heated air current is delivered downward close above the surface of the liquid in the test tube, the tube being heated at the same time by immersion in a bath of aqueous sulfuric acid of which the concentration is such as to give a boiling point of from 110 to 120° C. Air temperatures of from 200 to 300° were produced and were found to be adequate for satisfactory evaporations.

An improved method of measuring glass electrode potentials, R. J. FOSBINDER and J. SCHOONOVER (*Jour. Biol. Chem., 88 (1930), No. 2, pp. 605–614, figs. 5*).—An improved form of vacuum tube potentiometer is described in this contribution from the University of Pennsylvania. It is stated that, in connection with a constant temperature cell of new design, the instrument permits the accurate determination of the paH of as little as 0.05 cc. of fluid.

"A review of the data presented reveals two outstanding facts, one of which is that the glass electrode is entirely reversible in the pH range studied, the other that it is apparently as accurate as the hydrogen electrode. In the most alkaline mixture used, the buffer was diluted in order to preclude any possible salt effect. . . . We find that it is quite advisable to select an electrode having a low asymmetry potential if accurate results are to be obtained."

As an illustration of the wide range of applicability of the glass electrode it is noted that successful measurements were made of the pH value of solutions of nitrocellulose in acetone.

The application of the quinhydrone electrode to the determination of the pH of serum and plasma, E. P. LAUG (*Jour. Biol. Chem., 88 (1930), No. 2, pp. 551–573, figs. 4*).—A comparative study, carried out at the University of Pennsylvania Medical School, of the pH of normal dog serum and plasma at 38° by the hydrogen and quinhydrone electrodes indicated that the quinhydrone electrode reads an average of 0.03 pH more acid than does the hydrogen electrode. Under the experimental conditions, this difference remained sufficiently constant to indicate the reliability of the method. Determinations of pH with the quinhydrone electrode could be made rapidly and required but small amounts of fluid.

The theoretical considerations involved in the behavior of the quinhydrone electrode in the pH range of blood serum and plasma are briefly discussed, the apparatus is described, and considerable experimental data are presented.

A method for the estimation of iron in biological material, R. HILL (*Roy. Soc. [London], Proc., Ser. B, 107 (1930), No. B 750, pp. 205–214*).—It was found that α α′ dipyridyl is peculiarly suited to the use of a reagent for the colorimetric estimation of inorganic iron in biological material. "The color is almost specific for ferrous iron, other metals such as copper giving but faint colors. There is no necessity for ashing, while other methods require it. The standards can be kept indefinitely, and the fluid after adding dipyridyl for estimation can be kept without fear of the color fading. The color is given quantitatively over a region of pH which covers the physiological range. It is possible to determine the ferrous and ferric iron in a mixture. The color does not become yellowish in great dilution. The color is stable to reducing agents such as sodium hydrosulfite. The sensitivity approaches that of the thiocyanate method, it being possible to detect iron in a concentration of 0.0002 mg. per cubic centimeter in a layer of fluid 1.3 cm. thick. Hematins and their various compounds do not give a reaction for iron with α α′ dipyridyl."

The analytical procedure found suitable for such a colorimetric determination is detailed.

A note on the determination of iron in milk and other biological materials, C. A. ELVEHJEM (*Jour. Biol. Chem., 86 (1930), No. 2, pp. 463–467*).—In this article from the University of Cambridge, England, the author describes

a revised method for determining the amount of iron in milk. This method eliminates the difficulties encountered due to the formation of pyrophosphate during the ignition of the milk samples. The method may also be used for iron determinations of biological samples rich in phosphorus.

A micro colorimetric method for the quantitative estimation of iodine in blood, R. G. TURNER (*Jour. Biol. Chem., 88 (1930), No. 2, pp. 497–511*).—The method involves oxygen combustion in an open dish, removal of interfering substances, oxidation with bromine, and determination of the iodine by comparison of the color produced with the starch-iodide reaction, and is a contribution from the Detroit College of Medicine and Surgery. "The method is applicable for the detection of minute amounts of iodine ranging from 0.0005 mg. to 0.005 mg. with an error of 10 to 15 per cent."

A method for the preparation of blood filtrates for the determination of sugar, M. SOMOGYI (*Jour. Biol. Chem., 86 (1930), No. 2, pp. 655–663*).—Description is given of a procedure, stated to be rapid, simple, and inexpensive, for the deproteinization of blood samples by means of zinc hydroxide formed in situ from solutions of zinc sulfate and of sodium hydroxide. "In the same operation the nonfermentable reducing substances are precipitated also, so that the protein-free filtrates give true sugar values with alkaline copper solutions."

For the purpose of comparing the zinc precipitation with the tungstate precipitation, blood samples were laked in three volumes of water, were rendered sugar-free by yeast fermentation, and were freed from yeast by centrifuging twice. "The sugar-free blood was divided in two portions, to one of which a known amount of glucose was added. Each sample was then deproteinized by both the tungstate and the zinc procedure and the reduction of the filtrates determined by the Shaffer-Hartmann method. The results show that added glucose is quantitatively recovered in the zinc filtrates. Nothing is lost in the process of precipitation, and nothing added from the nonsugar reducing substances. The tungstate filtrates—it is again demonstrated—give reduction values representing with fair approximation the sum of added glucose and the nonfermentable reducing substances . . .

"If zinc filtrates contain sugar as the sole substance oxidizable by alkaline copper reagents, then different methods for the determination of sugar should yield identical results. In a previous study we found this to be the case. Parallel sugar determinations were performed by the Folin-Wu method, by Benedict's method, by Folin's modification of the Folin-Wu method, and by the Shaffer-Hartmann method, with the result that the four procedures give substantially identical sugar values in zinc filtrates."

A new method for enzymic clarification of unfermented apple juice, Z. I. KERTESZ (*New York State Sta. Bul. 589 (1930), pp. 10, fig. 1*).—An enzyme shown to be capable of decomposing soluble pectin "is proposed as an agent for assisting in the clarification of apple cider. This enzyme acts on pectin and produces no changes in starches or proteins. During the decomposition of the pectin of the apple juice by the enzyme some insoluble materials are formed. These insoluble substances, together with other substances responsible for the cloudiness of cider, are easily removed by filtration or centrifugation, leaving a crystal clear product which may be pasteurized and bottled within 24 hours after pressing the cider. The product is very palatable and possesses no 'cooked' taste."

The pectinase used for the clarification was found to be produced by a number of microorganisms, notably *Penicillium glaucum*. This organism grown on a suitable culture medium, "has been found to be an excellent source of this enzyme. . . . The enzyme can be prepared in liquid or solid

form. . . . This enzyme also decomposes pure pectin solutions. In this case the optimal acidity has been found to be pH 3.0 to 3.5 and the optimal temperature around 104° F. (40° C.). If heated to 131° F. (55° C.) for 30 minutes the enzyme is completely inactivated. The preparations used did not display any starch-converting activity."

Directions for clarifying cider with the pectinase preparation described are given.

METEOROLOGY

Report of the chief of the Weather Bureau, 1929–30 (*U. S. Dept. Agr., Weather Bur. Rpt. 1930, pp. V+264, pls. 8*).—This report gives a general summary of weather conditions of each month of 1929, brief summaries of data regarding tornadoes, hail, losses from windstorms, sunshine, and excessive rainfall during the year, and detailed tabulations of data for pressure, temperature, precipitation, humidity, cloudiness, wind, and evaporation throughout the United States. Topics chosen for particular discussion in the report are the unprecedented drought of the summer of 1930, previously noted (E. S. R., 64, p. 415), and expansions of service in aid of aviation.

Climatological data for the United States by sections, [September-October, 1930] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 17 (1930), Nos. 9, pp. [201], pls. 3, figs. 3; 10, pp. [201], pls. 3, figs. 3*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1930.

Weather reports, H. W. ALBERTS ET AL. (*Alaska Stas. Rpt. 1929, pp. 3, 4, 9, 10, 20–23, 35, 36, 48–57*).—Seasonal conditions at the Sitka, Fairbanks, Matanuska, and Kodiak Stations and monthly summaries of observations at 37 meteorological stations for 1929 are reported.

At the Sitka Station the growing season was cool and wet. The mean temperature for the period May to September, inclusive, "was 51.9° F., and the total precipitation for the same period was 22.04 in. There were 12 clear days, 60 partly cloudy days, and 81 cloudy days. The last killing frost in the spring occurred May 30, and the first killing frost in the fall October 20. The frost-free period was 143 days."

At the Fairbanks Station the winter of 1928–29 was unusually mild, although there were several periods of very cold weather of short duration. The minimum temperature for the winter was —38°. The maximum summer temperature was 86°. The total snowfall was 94.1 in., which was 47.5 in. more than the 17-year average. "The total precipitation from October 1, 1928, to September 30, 1929, was 15.36 in., which was 6.44 in. above the total for the preceding year and 3.62 in. more than for the 17-year average." The precipitation for the growing season was 8.64 in. The last killing frost in the spring occurred May 26 and the first in the fall September 20, giving a frost-free period of 117 days, which was 16.6 days above the normal. There was an abundance of moisture in the soil throughout the growing season, and weather conditions were favorable for growth of all crops, but especially for hay and pasture crops. "Harvesting in August was much interfered with by frequent rains and cool, cloudy weather. Ideal weather for harvesting prevailed during the greater part of September."

At the Matanuska Station the total precipitation for the year 1929 was 16.82 in., as compared with the 10-year average of 14.75 in. The early part of the growing season, however, was comparatively dry. The precipitation of the latter part of the season was materially above the average and delayed harvesting. A comparison of average monthly temperatures for 1919 to 1929,

inclusive, shows that "in 1929 the mean temperatures for March and April were 3.58 and 2.83°, respectively, lower than for the average for those months for the 10 preceding years. The mean temperature for August, 1929, was 2.7° lower than the average for that month for the 10 preceding years and retarded maturity of farm crops. . . . In 1929 during April to September, inclusive, there were 92 cloudy days as compared with the average of 57.2 cloudy days for the 10 preceding years. Increased rainfall, decreased temperature, and additional cloudy days were the main factors which caused low yields this season."

The weather at the Kodiak Station on Kalsin Bay "was mild and differed only from average winters by reason of excessive rainfall."

Meteorological observations, [November-December, **1930**], C. I. Gunness and K. M. Wheeler (*Massachusetts Sta. Met. Ser. Buls. 503–504 (1930), pp. 4 each*).—Summaries of observations at Amherst, Mass., during November and December, 1930, and normals and extremes for the period 1889 to 1929, inclusive, are given.

The December number contains an annual summary for 1930, which shows that the mean pressure for the year was 29.98 in.; the mean temperature 48.6° F., highest 95° July 21, lowest −6° February 6; total precipitation 32.82 in., as compared with the normal of 43.4 in.; snowfall 29.5 in., as compared with the normal of 48.38 in.; mean cloudiness 55 per cent, bright sunshine 59 per cent; last frost in spring May 31, first in fall October 1; last snow April 24, first October 25. The data indicate rainfall and snowfall decidedly below normal in 1930.

SOILS—FERTILIZERS

[**Soil work, Oklahoma Station**] (*Oklahoma Sta. Rpt. 1927–1930, pp. 9–28, figs. 7*).—Of the soil items of this report, the following are noted:

Washing robs many Oklahoma farms, N. E. Winters.—An erosion survey was carried through 48 out of 77 counties, both gullying and sheet erosion being found a serious danger. The rough land was found to have suffered an erosion damage more severe than that noted on smooth land in the same rainfall belt. Suitable cropping appeared an important aid in the control of erosion. Soil under cotton without winter cover crop lost 15.9 tons from an acre where oats reduced the loss to 3.9 tons, and a sweetclover field lost but 0.5 ton. A part of the same field cultivated clean and weed-free lost more than 17 tons from each acre.

Soluble phosphorus indicates yield, H. J. Harper.—"A large number of soils were secured from experimental plats in Oklahoma and in other States. . . . Chemical studies on the above soils indicate that the phosphorus soluble in dilute acid will correlate well with increases in crop yields secured from phosphorus fertilization."

Fine limestone brings quick results.—"During the first two seasons the soil treated with limestone which was ground so that all of the material passed through a 100-mesh sieve produced larger yields of sweetclover than 4-mesh and 10-mesh limestone. When the 100-mesh limestone was applied at one-half the rate recommended to correct the acidity, larger yields were secured than when the full rate of 6,000 lbs. per acre was applied. One-fourth and one-eighth rates of fine limestone gave lower yields than the full rate."

A study of the acidity of over 3,000 samples of Oklahoma soils indicated that over 28 per cent of the surface soils in the eastern half of the State and about 7 per cent in the central portion are medium to strongly acid.

How fertilizers influence crop yields.—Local fertilizer tests indicated that phosphorus is deficient in a high percentage of central and eastern Oklahoma

soils and in the timbered sections. Nitrogen is becoming a limiting factor in west central and central Oklahoma.

Fertilizer value of cotton burrs.—"Cotton burr ashes have produced some increase in yield, but it is very evident that better results are secured when the cotton burrs are allowed to decay in the soil."

Treatment revives native pastures.—A representative statement is that "on a soil to which phosphorus and limestone had been applied in order to grow sweetclover, orchard grass and red top produced over twice as much hay following the sweetclover as was secured on an adjacent area where sweetclover made no growth the preceding year because of the acid condition and the low available phosphorus in the untreated soil."

Value of legumes as soil builders.—Cotton yields were not profitably affected by one sweetclover crop in a 3-year rotation. "Only four green manure crops have been studied in rotations with wheat. Sweetclover and Austrian winter peas have increased the yield of wheat secured following these crops as compared yith yields secured on adjacent plats on which no legume crops have been grown.

"Cowpeas and soybeans have not produced any appreciable increase in wheat yields secured after these crops were plowed under. Very poor inoculation is secured in case of cowpeas and soybeans in central and western Oklahoma excepting on some of the sandier soils, while good inoculation is secured on the roots of sweetclover and Austrian winter peas, because during the spring and fall months more favorable moisture conditions prevail and this factor seems to favor the development of nodules on the roots of legume crops which grow during those periods as compared with legume crops which are grown during the hot dry summer weather."

[Soil and fertilizer work at the Panhandle, Okla., Station], H. H. FINNELL (*Oklahoma Sta. Rpt. 1927–1930, pp. 322, 323, 325, 326, 327, 328*).—The following items are reported:

Nitrate studies.—"A tendency has been found for level methods of tillage to encourage a more rapid nitrification than listing; however, a deep tillage of any kind during the period when nitrification is most active temporarily retards the process especially in dry seasons. When the land was fall plowed, the more rapid nitrate increase occurred between April and June. When spring tillage or no deep tillage at all was practiced, the period of more rapid accumulation was between June and August. From August to December little change was noted in the nitrate content of the soil to a depth of 24 in. excepting on cropped land."

Run-off conservation.—"The 1930 results from terracing, average of all plats, showed an increase in crop production of 16 per cent. With the percentage gains in production previously reported, 1926, 49.1 per cent; 1927, 28.8 per cent; 1928, 9.4 per cent; 1929, 4.6 per cent; the current year's terrace gain brings the 5-year average increase in production to 23.6 per cent. . . . Terraced plats now in operation include spacings ranging from 3-in. vertical intervals to 12-in. on land with an average slope of 0.7 per cent."

Fertility survey.—Progress of a study of the depletion of fertility in cultivated land is reported.

"There appears to be considerable variation in the rate of leaching and erosion among light and heavy soil types of different topography, which accounts for more depletion than crop removals in some cases. There is little evidence, however, of serious leaching or erosion losses from the heavy silt loam type of soil which predominates in this area."

Wheat land organic matter.—"Beneficial results have so far been observed from early preparation and light manuring, but the experiment has not progressed far enough to reach any conclusions."

Effects of wind on plant growth.—It is stated that "pot experiments in which temperature, humidity, light, and soil moisture were controlled showed that exposure to wind in addition to increasing the water requirement retarded growth, reduced yields, delayed maturity, and tended to encourage secondary branching of the plants. Yield decreases were accompanied by the destruction of the tender parts of the foliage and deformity of the growing parts."

Laterite and lateritic soil in Sierra Leone, II, F. J. Martin and H. C. Doyne (*Jour. Agr. Sci.* [*England*], *20* (*1930*), *No. 1, pp. 135–143, figs. 4*).—The formation of lateritic soils and the composition of "some of the intermediate and final products formed" is the subject of the present contribution from the Sierra Leone Department of Lands and Forests, laterites and lateritic soils being defined on the basis of the silica : alumina ratio as in the preceding paper (E. S. R., 59, p. 811).

"The detrital soils in Sierra Leone appear on the whole to contain a higher proportion of alumina to silica than the residual soils. The soils described are all reddish or yellowish red soils, light in texture, and generally containing a high proportion of stones. They are acid in reaction and have a definite lime requirement. The mineral constituents are low, especially the potash and the exchangeable calcium. Soluble phosphorus is readily removed from a solution by these soils."

A comparison of the hydrometer method and the pipette method for making mechanical analysis of soils, with new directions, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 8, pp. 747–751*).—"The hydrometer method [E. S. R., 57, p. 710] . . . would seem to give," according to this contribution from the Michigan Experiment Station, "most, if not all, the essential information required for all practical purposes, and, considering its great rapidity, simplicity, efficiency, and reasonable accuracy, it should meet a great need. It should be clearly borne in mind that in view of the tremendous physicochemical variations that exist in the different soils, no one method, whether it be the hydrometer method or the pipette method, can be expected to be ideal for all types of soil, especially when a standardized procedure must be followed for all soils."

The inaccuracy of the quinhydrone electrode in many Kentucky soils, P. E. Karraker (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 2, pp. 171–180*).—The quinhydrone electrode gave pH values higher than those indicated either by the hydrogen electrode or by colorimetric methods when used in certain Kentucky surface soils. The discrepancies were not observed in the case of filtrates, but in suspensions reached 1.5 pH units, and differences of 1.0 pH unit were not unusual. The errors are attributed to "the presence of manganese in some particular form or forms, apparently more highly oxidized than the dioxide form," but could not be correlated directly with the total manganese content of the soils.

The influence of topography on soil profile character, E. A. Norton and R. S. Smith (*Jour. Amer. Soc. Agron., 22* (*1930*), *No. 3, pp. 251–262, figs. 3*).—The data presented in this contribution from the Illinois Experiment Station "indicate that a good correlation exists between topography and the depth to the zone of accumulation and four important characteristics of the soil profile. As the slope and drainage increase the depth to the zone of accumulation decreases, the texture changes from a heavy clay to a silt loam, the color from a

light gray to a reddish yellow, the structure from large angular aggregates which are columnarly arranged to relatively small subangular particles, and the consistence from highly compact, plastic, and slowly pervious to friable, loose, and open, irrespective of the rate or amount of surface material removed by erosion or accumulated by deposition. A slight change in the slope on nearly level topography has much more effect on the profile than an equal change on rolling topography. The soil of this region erodes more rapidly than the profile is developed on slopes of 14 per cent or more under grass vegetation, and on slopes of 17 per cent or more under forest cover."

Establishment and succession of vegetation on different soil horizons, J. D. SINCLAIR and A. W. SAMPSON (*Hilgardia* [*California Sta.*], *5* (*1931*), *No. 7, pp. 155–174, figs. 9*).—Three residual soil series, Holland, Aiken, and Olympic, were used, each representing an extensive soil type in California. "Residual soils were used because of the desire to identify the parent material and to be able to determine the depths of the different horizons."

"The rate of growth, both of the annual and the perennial species studied, was appreciably greater in soil horizon A than in horizons of lower depth regardless of the soil series or the species used. Likewise the amount of plant material produced in soil horizon A was consistently greater than in soil horizon C, regardless of species or soil series. This held true, also, in soil horizon B with the exception of the Olympic soil," in which the B horizon proved nearly as productive as did the A horizon for two annual species. "This deviation from the average trend may be accounted for by the fact that the soil used to represent the Olympic series was procured in grassland formation, hence the B horizon may have been subject to greater accumulation of materials from the upper horizon than in the forest soils. The number of days required for flower production and for the maturity of seed varied widely, but was much earlier in horizon A than in horizons B and C." In the two layers last named the perennial species produced hardly any seed. "Also, a difference was noted in the time of flowering and seed maturity in horizon A of the three soil series, the earliest maturity occurring in the Holland soil, followed by the Olympic, and then by the Aiken."

The water requirement for a unit of dry material produced was in all cases greater in horizon C than in horizon A, "and with two exceptions, in the Olympic soil the water requirement was slightly greater in horizon B than in horizon A. Artificial packing, simulating in a way cultivation, tended to cause deviation from the rhythmic growth cycle procured in the naturally packed soils. This may be accounted for by the change in soil structure and in increased aeration."

The work indicated that "where soil horizon A has been largely or wholly removed by erosion . . . it would be a mistake to attempt to establish a cover of perennial grasses with a view to binding the soil and preventing further soil transportation. The normal stages of plant succession must each play its part. For several years the cover will normally consist of annual species. Accordingly, the management of the areas must at first concern itself with annual vegetation, regardless of whether seed is introduced or the invading cover is to be fostered in way of natural revegetation."

A chemical and microbiological study of Lufkin fine sandy loam in relation to productiveness, E. B. REYNOLDS (*Texas Sta. Bul. 421* (*1931*), *pp. 30*).—A study of some factors of productiveness in Lufkin fine sandy loam soil at College Station, Texas, in 1925, 1926, and 1927, indicated that the nitrifying power of the soil was positively and significantly correlated with the yields of cotton and corn. The nitrifying capacity of the soil was a better index of the

crop-producing power of the soil than was the total nitrogen, the total phosphoric acid, or the active phosphoric acid of the soil.

The addition of cottonseed meal, manure, superphosphate, and ground rock phosphate stimulated the nitrifying power of the soil and increased the production of nitrates in field soil. Under laboratory conditions the addition of lime increased the power of the soil to produce nitrates, although this increased nitrifying power was not more significantly correlated with the yields of cotton and corn than was the nitrifying power of the soil without lime. Seasonal conditions did not influence the nitrifying power of the soil under laboratory conditions, as indicated by analyses of samples taken at monthly intervals during the growing season.

The continuous growing of cotton and of corn decreased the production of nitrates in field soil. The continuous growing of corn also had a tendency to weaken the nitrifying power of the soil, "a fact which apparently explains why the yield of corn is reduced more by continuous cropping than is the yield of cotton.

"The accumulation of nitrates in the soil gradually increased as the season advanced, reaching a peak in July in the soil under cotton and in August in the soil under corn, and decreased thereafter.

"The use of the statistical method appears to be a promising means of interpreting soil fertility data and increasing the reliability of conclusions drawn from such data."

Studies in the physical properties of soils, IV, V, W. B. HAINES (*Jour. Agr. Sci. [England], 17 (1927), No. 2, pp. 264–290, figs. 10; 20 (1930), No. 1, pp. 97–116, figs. 6*).—These two papers continue a series of which the previous contributions have been noted (E. S. R., 54, p. 581).

IV. *A further contribution to the theory of capillary phenomena in soil.*—The theory of the capillary behavior of moist soil "is considered in relation to capillary rise in soils as well as to the problem of cohesion previously dealt with. It is shown that the moisture distribution attained by capillary rise can be inferred from simple direct measurement of the suction pressure. . . .

"It has been shown that the suction or pressure deficiency which is necessary to draw an air-water interface into the pores of a soil is one that characterizes the capillary behavior over a considerable moisture range, and the term 'entry value' has been applied to it. From a complete suction curve it is possible to infer a size distribution curve for the soil interstices analogous to the treatment of particle size in mechanical analysis of soils. The results of a number of suction measurements on materials of a granular nature are given."

V. *The hysteresis effect in capillary properties, and the modes of moisture distribution associated therewith.*—"A recapitulation of the main features of the moisture distribution in an ideal soil is given in order to emphasize a point previously neglected, namely, that the changes are not in the main strictly reversible, but fall into two series corresponding to the two directions of moisture change. The cellular nature of the soil pore space imposes a quantum character on the moisture changes over a great part of the higher moisture range. The individual cell does not fill or empty by smooth reversible changes but shows two unstable stages at which filling or emptying is completed at a bound. For falling moisture the suction level is that at which a meniscus can invade a cell through one of its narrow entries, which gives a value in the neighborhood of 12 T/r for close packing. For rising moisture the suction level is that for which water returns to the cell by the collapse of a bubble in it, giving a lower value in the neighborhood of 6.9 T/r. A still lower

value of 4.5 T/r can be reached for a particular type of distribution confined to the lower moisture range.

"All the above suction values are closely verified by measurements made with bronze balls and paraffin oil. A detailed exploration of the case for glistening dew [small spherical glass beads of which the mean particle radius was 0.019 cm.] and water has been made, which verifies the theory while illustrating more nearly the behavior of an irregular soil. The two values which rule the two halves of the 'hysteresis loop' for this case of natural or common packing are 6.0 T/r for falling moisture and 4.0 T/r for rising."

The moisture-saving efficiency of level terraces under semi-arid conditions, H. H. Finnell (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 522–529*).—It was found in the work here reported from the Oklahoma Panhandle Experiment Station that suitable terracing permitted the utilization of 2.33 in. annually of run-off water capable, on a terrace, of a penetrating efficiency of 34.5 per cent, and increased the annual soil water supply from 3.58 to 4.38 in. It is further noted, however, that "this is only about half the water-holding capacity of silty clay loam soil to a depth of 6 ft. When the maximum efficiency of saving run-off water has been reached there is still use for any other method of culture or farm practice that will hasten absorption for the lessening of the enormous evaporation loss. . . . [Also], although the validity of some of the assumptions used in the formula presented is questionable, the principle of distributing saved run-off water at intervals insuring its full productive usefulness is thought to be basic."

Effects of cropping on the physical condition of the soil with data on yields, J. W. Gilmore (*Jour. Amer. Soc. Agron., 22 (1930), No. 2, pp. 181–188, figs. 4*).—In a report on plow draft and yields of fallow, continuously cropped, and rotation cropped plats, contributed from the California Experiment Station, it is noted that "all of the data taken together indicate that changing the crops on the land and thus altering the treatment or cultivation of the soil has a tendency to modify the physical condition of the soil as it affects the draft of the plow. . . . That the physical condition of the soil of the check plats deteriorated was observed by workmen who plowed these plats each fall for several years before these tests were made. Each year the plowmen observed that the feel of the plow indicated the check plats as it crossed them, and the effect grew more noticeable each year. Aside from the marked differences in both draft and yield between the check and treated plats, it might be stated that the check plats also showed a marked infestation of weeds, including especially wild oats and morning-glory."

The origin, nature, and isolation of the inorganic base exchange compound of soils, E. Truog and J. A. Chucka (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 553–557*).—Extending Kerr's observation (E. S. R., 59, p. 420) of the identity of the base exchange compounds in bentonite and in mineral soils, the authors of the present contribution from the Wisconsin Experiment Station (1) developed a sensitive test for the presence of the base exchange compound, (2) indicated experimentally the probable origin of the base exchange compound as found in soils, and (3) separated the compound from bentonite in a form showing an alumina-silica ratio approximating 1:4, and from a soil a compound of similar properties.

1. *Test for the base exchange compound.*—"A pinch of soil or other material under question is treated with a 0.5 per cent solution of the basic dye fuchsine, and then washed with water and finally alcohol to remove all of the dye held physically. If base exchange material is present it will be highly colored by the dye and may be detected to advantage with a microscope. The presence

and location of the base exchange compound in soils may be readily shown with this test."

2. *Origin of the base exchange compound*.—"Evidence is presented which indicates that the base exchange compound is formed from feldspars under alkaline weathering conditions. Powdered albite leached with a 1 per cent solution of $NaHCO_3$, which has a pH of about 8.3, gave rise to the base exchange compound. Water in contact with powdered feldspars attains a pH of about 8.4 in the course of several days. At this pH feldspars are unstable and break down into the base exchange compound and silica. . . . Soils are subjected to both acid and alkaline weathering. Between rains and periods of leaching, the films of water around the particles of feldspars come to a pH of 8.4. As a result, the feldspar gradually gives rise to base exchange material."

A similar explanation of the possible formation of bentonite from volcanic dust is offered.

3. *Isolation and examination of base exchange compounds*.—"The base exchange compound was separated from bentonite by sedimentation and purified by treatment with N/10 HCl and 2 per cent Na_2CO_3 solution. The purified material on analysis gave a ratio of alumina to silica of approximately 1:4. A compound of similar properties and alumina-silica ratio was separated from a soil by leaching the soil first with dilute acid to remove bases and then water to remove the acid and other electrolytes. In the absence of bases and electrolytes, the base exchange compound deflocculates and may then be slowly leached out with water."

The phosphorus content of the soil solution and its relation to plant growth, J. W. TIDMORE (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 481–488*).—Corn, sorghum, and tomatoes did not make a satisfactory growth at the Alabama Experiment Station in culture solutions of which the phosphate concentration was less than 0.1 part per million, whereas the same plants grew well in many soils of which the displaced solution contained less than 0.05 part per million. "This would seem to indicate that plants growing in the soil could obtain phosphate which is not in the displaced solution. It is thought that the following points should be emphasized in this connection: (A) soil-root contact, (b) solvent action of CO_2, (c) extent of root system, (d) plant differences, and (e) a higher PO_4 concentration around the soil particle."

Influence of alfalfa on the change of virgin soils in the cotton districts of Armenia, K. P. MIRIMANOFF (*Jour. Amer. Soc. Agron., 22 (1930), No. 2, pp. 97–107*).—Profiles of soils never under cultivation were compared in mechanical and chemical composition, in base-exchange behavior, and in physical properties with soils of similar type but under cultivation for about eight years. In addition to the laboratory results with these soils there are given brief accounts of the relief and parent materials, the hydrography, the climatic conditions, including the January-February and July-August soil temperatures at depths of 5, 10, and 20 cm., and the natural vegetation of the Echmiadzin district of Armenia, from which the samples were taken. The paper is a contribution from the Central United Laboratory of Armenia.

"In the virgin soils after prolonged cultivation to alfalfa the silt and clay fractions increased, especially in the upper layers. The physical properties of soils after alfalfa cultivation were considerably improved, due to increasing noncapillary porosity and the raising of the water capacity of the soil. The amount of organic matter in the surface layers greatly increased. The amount of hygroscopic moisture also increased. The nitrogen content increased in the first layer, but decreased in lower layers. A marked depression in CO_2 content was observed. In water extracts from soils cropped to alfalfa the amounts

of dissolved salts decreased, due mainly to the decline of alkalinity. The amount of exchangeable cations greatly increased in the upper layers, due to the increasing amounts of calcium and potassium. On the contrary, the amount of exchangeable sodium decreased remarkably."

The spontaneous culture method for studying the non-symbiotic nitrogen-fixing bacteria of soils, R. H. Walker, J. L. Sullivan, and G. G. Pohlman (*Jour. Amer. Soc. Agron., 22 (1930), No. 7, pp. 642–648, fig. 1*).—By the simultaneous use of Winogradsky's soil plate and silica gel plate procedures, it appears to the authors of this contribution from the Iowa Experiment Station "quite probable that accurate information may be obtained regarding both the occurrence and activities of the aerobic, nonsymbiotic, nitrogen-fixing bacteria of soils. In addition it is entirely possible that its use may be extended to the study of soil deficiencies, such as a lack of lime, phosphorus, and other necessary food constituents. This method certainly has many advantages as it is simple in manipulation, it requires only a comparatively short time to obtain results, and, most important of all, it permits of the study of the nitrogen-fixing bacteria in their natural habitat and under practically the same environmental conditions to which they are accustomed in the soil in the field."

Both of the parallel procedures of the Winogradsky method are described, the silica gel plates having been made according to that form of the method given by Fred and Waksman (E. S. R., 60, p. 890).

The effect of barnyard manure on a calcareous soil, D. W. Pittman (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 549–552*).—Extending an earlier report (E. S. R., 57, p. 231) on the nature of the effect of manure applications on sugar beet yields, the present contribution from the Utah Experiment Station states the results of determinations of soluble soil phosphates by a form of the cerulean molybdate method (E. S. R., 52, p. 311), of nitric nitrogen by the phenoldisulfonic acid method, and of organic matter by the Schollenberger rapid approximate procedure (E. S. R., 58, p. 113); gives the 15 correlations of yield to soluble phosphorus in the soil, yield to nitric nitrogen in the soil, yield to manure added to soil each year, yield to total manure added to soil, yield to organic matter in the soil, soluble phosphorus in soil to total manure added, soluble phorphorus in soil to manure added each year, soluble phosphorus in soil to nitric nitrogen, soluble phosphorus in soil to organic matter, nitric nitrogen to organic matter, nitric nitrogen to total manure added, nitric nitrogen to manure added each year, organic matter to total manure added, organic matter to manure added each year, and the multiple correlation of yield to combined effect of soluble phosphate, nitric nitrogen, and organic matter; and presents the following conclusions:

"From these correlations it seems that the amount of available phosphorus in this soil is very largely influenced by the amount of manure applied, and that the low yield of sugar beets on the unmanured soil is due as much to the lack of soluble phosphorus in the early growing season as to the lack of nitric nitrogen. As in the previous results there is a smaller correlation between yield and organic content of soil than between yield and nitric nitrogen. Since this soil is relatively rich in total phosphorus (0.41 per cent P_2O_5), it is possible that an explanation of its unavailability might be found in the high lime content of the soil, which shows about 42 per cent calcium and magnesium carbonate. Later in the season the soluble phosphorus of nearly all of these plats was reduced to an amount too small to be shown by this test. The high multiple correlation $R_{(y.123)}$ shows that the combined effect of the three factors—soluble phosphate, nitric nitrogen, and organic matter—is quite important in determining the increased yield of the manured plats. From all of this it would seem

that on this highly calcareous soil farm manure is essential to sugar beets, largely because of its making the phosphorus available and increasing the content of nitric nitrogen in the soil."

Effect of associated soil treatments on the availability of applied phosphates to field crops on different soil types, G. Roberts (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 489–497, figs. 7*).—The effects in seven fields, of which the layout has been noted in a preceding publication (E. S. R., 56, p. 812), of no treatment, limestone, superphosphate, rock phosphate, and potassium salts, and of certain combinations of these are given in terms of crop yields tabulated, graphically represented, and discussed at some length.

In connection with the rock phosphate trials it is noted that "if a means could be discovered for setting up the conditions under which rock phosphate functions well, it might become a very economical source of phosphorus on those soils where phosphorus is such an important factor, as in the case of the [Kentucky] soils which this paper discusses. It is suggested that a small amount of finely ground lime used far enough ahead of the use of rock phosphate to permit the disappearance of calcium carbonate from the soil might be a solution of the difficulty where lime interferes with the availability of rock phosphate. Even if adverse soil conditions could not be remedied, it would be highly desirable to have some quick test by which it could be determined whether the use of this form of phosphate would be desirable."

The influence of season upon the disintegration of limestone in soil, W. H. MacIntire and W. M. Shaw (*Jour. Amer. Soc. Agron., 22 (1930), No. 3, pp. 272–276, fig. 1*).—The experiment here reported was carried out at the Tennessee Experiment Station on an acid Hagerstown clay loam of which samples amounting to 18 lbs. on the basis of dry soil were treated with ground limestone or dolomite in 2-gal. pots having drainage holes.

"The disintegration of limestone may be considered as primarily registering the periods when there were effective concentrations of CO_2 in the free soil water and the duration of these periods. It appears that the supplies of CO_2 that were available during the spring months and during the intermittent moist periods of the summer months were more effective than those supplied during the fall and winter months. During the latter period the rainfall is not so readily evaporated and the interstitial pore spaces of the soil are filled with water within temperature ranges that are not conducive to the generation of CO_2, hence the limestone disintegration, as controlled by moisture distribution and temperature range, was more extensive during the April-October period than during the period extending from October to April. . . .

"Previous experiments with the same soil have shown that additions of limestone and dolomite induce accumulations of nitrates and sulfates during the months embraced in the first six-month period. On the other hand, the production of nitrates during the winter months was practically nil. Hence, for this soil, under fallow conditions, the disintegration of the limestone and dolomite is more extensive during the season when temperature and periodicity of rainfall produce the greater biological activities."

The effect of manganese, copper, zinc, boron, and arsenic on the growth of oats, J. S. McHargue and O. M. Shedd (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 739–746, figs. 4*).—In cultures of oats in purified sand to which had been added "small amounts" of manganese, copper, zinc, boron, and arsenic compounds, the added elements produced, according to the Kentucky Experiment Station, "very marked increased yields in comparison with the checks. However, when compared with the manganese treatments, copper and zinc gave additional increases in the yield of grain and straw. The addition of boron

gave an increase in the yield of straw but a decrease in the yield of grain when compared with the manganese treatment. With the addition of arsenic an increase in the yield of straw as compared with mangagnese alone was maintained, but a decided diminution in the yield of the grain resulted. Pyrolusite (MnO_2) added to a basal plant nutrient culture produced the maximum yield of grain but not the largest yield of straw. A complete mineral analysis of the ash of the straw produced in each of the cultures gave some interesting relations in regard to the assimilation of the different elements. From the results obtained in this experiment it is to be assumed that manganese, copper, zinc, and possibly boron are important factors in the growth of oats."

Activated sludge as a fertilizer for cotton and corn, E. B. Reynolds (*Jour. Amer. Soc. Agron., 22 (1930), No. 6, pp. 537–539*).—The average yield increase attributed to sludge applied at 1,000 lbs. to the acre at the Texas Experiment Station and the Angleton Substation was 17 and 16.4 per cent, respectively, in the case of cotton and 13.9 per cent in that of corn. The value of the sludge is stated on the basis of these results and of current crop value figures.

Computation of fertilizer mixtures from extra-high analysis fertilizers, E. P. Deatrick (*Jour. Amer. Soc. Agron., 22 (1930), No. 8, pp. 725–738, figs. 2*).—Of the extra-high analysis fertilizers now marketed most do not fit into the fertilizer triangle scheme, according to this communication from the West Virginia Experiment Station, and the use of certain equations and their solution with the help of determinants is recommended on the ground that "the use of these formulas simplify considerably the mathematical operations, especially in the solving of no-filler mixtures, if they are used merely to eliminate the trial and error of the mathematical method and not for the complete solution." Examples of the use of equations of the recommeuded type are set up and solved.

Analyses of commercial fertilizers, H. E. Curtis, H. R. Allen, and L. Gault (*Kentucky Sta. Bul. 298 (1929), pp. 303–401*).—The usual analyses are fully presented for the year 1929.

Inspection of commercial fertilizers for 1930, T. G. Phillips, T. O. Smith, and S. J. Fisher (*New Hampshire Sta. Bul. 254 (1930), pp. 14*).—Of 437 guaranties carried by the 117 brands of fertilizers analyzed, only 57, or 13 per cent, were not met, and "many of the deficiencies were comparatively negligible, the small deficiency in one constituent being offset in value by overrun in other constituents." The percentage of guaranties not met was about the same as that of the previous year, but decidedly better than that (10.6 per cent) of 2 years before.

Commercial fertilizers, J. S. Jones and C. F. Whitaker (*Oregon Sta. Circ. 98 (1931), pp. 32*).—"To promote intelligent buying of commercial fertilizers occasion is taken in the publication of this report to include a brief discussion of the chemical nature of materials that impart value to the finished product."

Land-plaster and liming materials are included among the products analyzed during the biennium ended with December, 1930. A tendency toward more concentrated types of fertilizer mixtures was noted.

AGRICULTURAL BOTANY

Possibilities for international co-operation in agroecological investigation, B. M. Bensin (*Internatl. Rev. Agr., Mo. Bul. Agr. Sci. and Pract. [Rome], 21 (1930), No. 8, pp. 277–284*).—This article is discussed editorially on page 701.

The plant in relation to water, N. A. Maximov, trans. edited by R. H. Yapp (*London: George Allen & Unwin, 1929, pp. 451, pls. 5, figs. 41*).—This book, the authorized English translation, edited with notes by Professor Yapp, who died

just after revising the final proof, contains a brief outline of his life and work, the author's preface to the original Russian and his preface to this English edition, a brief introduction to the main body of the book, an extensive bibliography, and an analytical index.

"The main purpose of the book, then, is to give those engaged in experimental research, as well as students of botany and agriculture, an account of what has been and still is being done in the elucidation of problems connected with the drought resistance of plants."

Effect of wind on plant growth, H. H. FINNELL (*Jour. Amer. Soc. Agron.*, *20* (*1928*), *No. 11, pp. 1206–1210, figs. 4*).—Statistical analysis having indicated a greater damaging effect from high wind than increased transpiration alone would seem to justify, simple pot tests were devised and carried out with marigolds as the tender foliage plants, using wind at 15 miles per hour as the sole variable factor to be studied. The preliminary results are herein presented.

A portion of the tender foliage was destroyed by the whipping of the wind, deformation of the main stem was marked in early growth stages, and the rate of growth in height was immediately reduced. The time of maturity was lengthened by wind about 10 days for a 60-day period. Yield of dry matter was reduced 48.8 per cent by wind. Total water requirements per pot did not vary significantly. Water requirements per unit of dry matter produced were approximately doubled by exposure of plant and pot to wind, which also apparently increased the number of secondary branches formed by 42.8 per cent.

Heritable differences in transpiration between ecotypes of a plant species, G. TURESSON (*Hereditas*, *11* (*1928*), *No. 2–3, pp. 193–206*).—Study including transpiration measurements as made on ecotypes, or hereditarily differentiated adaptation types, of *Bellis perennis* (a maritime and a continental ecotype), of *Melandrium rubrum* (a maritime and a relatively dry-land ecotype), and of *Rumex acetosa* (a high alpine dwarf ecotype) is considered to show, as regards amount of transpiration, definite and clearly heritable differences under constant conditions such that the high alpine dwarf ecotypes and the maritime ecotypes are distinguished by notably lower transpiration values from corresponding forms in the same species. These heritable differences in transpiration, considered in connection with the earlier found differences in osmosis, show that the plants referred to as ecotypes are to be placed in the same class of variants as the physiological types which are regarded as (wet or dry) climate adaptations.

The establishment of these definite and sharp ecotype differentiations within established species, in morphological as well as in physiological aspect, is thought to have high significance in experimental ecology.

A negative correlation observed between the nitrate nitrogen in the juice of beet leaves and the weight of the leaves, D. E. FREAR (*Jour. Agr. Research* [*U. S.*], *42* (*1931*), *No. 1, pp. 53–56*).—Noting a significant negative correlation between the weight of beet leaves and the amount of nitrate nitrogen in the extracted juice, analyses were made at the Rhode Island Experiment Station upon nearly mature leaves taken from plants growing on soil fertilized with an optimum amount of nitrogen. The results showed a negative correlation, -0.855 ± 0.052, between the weight and nitrate content. However when the leaf was divided, nitrate nitrogen was found much more abundant in the midrib tissue than in the mesophyll tissue. An examination showed that the proportion of midrib to mesophyll is markedly less in the larger leaves. Obviously, the larger leaf with a smaller proportion of midrib has a smaller percentage of nitrate, thus accounting for the negative correlation observed. The author emphasizes the need of selecting leaves of comparable size and of removing the midrib tissue before analysis.

Injection experiments on trees, R. J. D. Graham and L. B. Stewart (*Bot. Soc. Edinb. Trans. and Proc.*, *30* (*1927–28*), *pt. 1*, *pp. 19*, *20*).—Experiments are described which are said to have been begun in 1921 and to be still in progress, in which solutions of copper sulfate were introduced into trunks of trees (*Salix alba*, *Fagus sylvestris*, *Ulmus campestris*, *Acer pseudoplatanus*, *Tilia europaea*, and *Pyrus malus*) about 3 ft. above the ground, between May and July, the course of the solutions being traced as indicated by the use of potassium ferrocyanide.

The first traces of injury to the leaves appeared within 48 hours, the first leaves affected being on the first branch diametrically opposite the point of injection, though the branch just above that one was not affected. Later, the crown of the tree was affected, though the position and area of the injury varied greatly. Little difference of intake as between day and night was noted. After the shriveling of the leaves the rapid intake continued, increasing at night and particularly on the approach of showery weather.

Light receptors in Mesembryanthemum, C. I. Kean (*Bot. Soc. Edinb. Trans. and Proc.*, *30* (*1927–28*), *pt. 1*, *pp. 37–42*, *figs. 2*).—This descriptive account also expresses the author's views as to relations between translucent spots on leaves of *Mesembryanthemum* spp. and chemical features. The spots described affect the acidity of the aqueous tissue.

GENETICS

Biochemistry and the problems of organic evolution, R. A. Gortner (*Sci. Mo.*, *30* (*1930*), *No. 5*, *pp. 416–426*).—Various organic processes in plant and animal life are discussed from the biochemical standpoint, and the similarity between the amino acids, proteins, hormones, and vitamins in related species is noted. Special attention is given to the similarity in composition of chlorophyll, hemoglobin, and pinnaglobin as indications of the common origin of widely different living forms.

Chromosome numbers in some higher plants, I, T. Sugiura (*Bot. Mag.* [*Tokyo*], *42* (*1928*), *No. 503*, *pp. 504–506*, *figs. 16*).—The author has determined the chromosome numbers in the 15 higher plants.

The inheritance of shank-feathering in the domestic fowl, W. V. Lambert and C. W. Knox (*Poultry Sci.*, *9* (*1929*), *No. 1*, *pp. 51–64*).—In a study of the inheritance of shank feathering at the Iowa Experiment Station, crosses were made between Black Langshans and White Plymouth Rocks and Buff Orpingtons. All F_1 chicks and adults were shank feathered, but the degree of feathering was less than in the Langshan parent. F_2 and back-cross data supported the conclusion that there were two dominant factors, either of which was capable of producing shank feathering. The two factors were inherited independently of each other, the *C* factor, and sex, but there was a deviation of 10.4 ± 8.5 per cent from the expected percentage in the offspring in case of independent inheritance of one of the factors for shank feathering and the *W* factor for skin color.

Studies on inheritance in pigeons.—VIII, "Porcupine" pigeons, L. J. Cole and L. E. Hawkins (*Jour. Heredity*, *21* (*1930*), *No. 2*, *pp. 50–60*, *figs. 8*).—In continuing this series from the Wisconsin Experiment Station (E. S. R., 64, p. 28), a type of feather structure in pigeons in which the barbs and barbules developed imperfectly is described as previously noted (E. S. R., 63, p. 29). This condition appeared to be recessive to the normal.

Pigs inherit swirl hair, W. A. Craft (*Oklahoma Sta. Rpt. 1927–1930*, *p. 56*).—Evidence obtained from the production of 288 pigs indicates that the swirl

character in the hair is hereditary and is transmitted through both the sire and the dam.

Further studies on the inheritance of milk production in cattle [trans. title], C. von Patow (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 17 (1930), No. 1, pp. 3–159, figs. 16*).—Continuing the studies on the inheritance of milk and butterfat production in cattle (E. S. R., 55, p. 525), recent findings on this subject are presented. The study reported was based on data from 10 herds, including 4,045 cows. The production records in the different herds extended over a period of from 18 to 53 years. The variability in the production within the different herds is discussed.

After consideration of the distribution of the different herds as to milk and butterfat production, it appeared that the data on milk production agreed quite closely with the hypothesis that cows have a basic production which is increased in accordance with the number of dominant factors present in the three pairs of genes responsible. Although fat production was closely associated with milk production, relatively high correlations being observed, there was another dominant factor for fat production. It appeared that these hypotheses explained the observations in the different herds where records were available for several generations of offspring.

"Duck-legged" cattle on Texas ranches, J. L. Lush (*Jour. Heredity, 21 (1930), No. 2, pp. 84–90, figs. 2*).—The occurrence of a characteristic type of short-legged cattle on several Texas ranches is reported. Examination of six endocrine glands of one animal indicated no abnormalities except that the pituitary seemed to be unusually small. The ranchmen appear to be desirous of continuing some of the short-legged cattle in the herds as there is some selection of breeding animals for that type.

Although complete breeding records were not available, it appears that the condition is inherited as a simple dominant factor.

Inheritance in the house mouse, the linkage relations of short-ear, hairless, and naked, G. D. Snell (*Genetics, 16 (1931), No. 1, pp. 42–74, figs. 7*).—The author discusses the unit characters in the nine linkage groups in the mouse, as well as the characters hemorrhagic head, flexed tail, and dwarf, and others for which the mode of inheritance has not yet been established.

The characters short ear and dilution appear to be very closely linked. With the additional data presented, there have been observed but two crossovers among 3,150 gametes tested. It was also observed that three mice heterozygous for dilution were dilute in hair character during the first month of life, but on shedding were classed as intense.

Breeding tests demonstrated that dominant hairless or naked and recessive hairless were not allelomorphic characters, and that dominant hairless was not located in any of the nine linkage groups. On the other hand, recessive hairless and piebald were linked, the crossover percentage found in 348 young being 9.8 per cent in females and 2.6 per cent in males. In the study four probable mutations to black and tan were recorded.

Comparison was also made of 16 measurements of the skulls of 13 short-eared mice and 12 heterozygous normal-eared sibs. These measurements, expressed as percentages of the basilar length, showed that the skulls of the short-eared mice were proportionately shorter and wider than the skulls of normals. The height of the rostrum was also reduced, and the weight was probably less in short-eared than in the normal sibs.

Sex determination at hatching, H. M. Molyneux (*Harper Adams Util. Poultry Jour., 15 (1929–30), No. 1, pp. 5–8*).—In a study of the identification of the sex of chicks at hatching from a cross of a Black Minorca male with

White Leghorn females, it was possible to determine correctly the sex of only 68 per cent on the basis of shank color. Eye color, rate of tail feathering, and down color did not behave as sex-linked characters.

In a cross of a Black Leghorn male with Barred Plymouth Rock females, it was possible to identify the sex at hatching correctly as the pullets had black heads while the cockerels showed a small white or cream spot on the top of the head. The pullets developed into a uniform flock of pure black birds with dark shanks, eyes, and beak, and a small single comb.

The sex was determined at hatching in only 56 per cent of the chicks from the cross Black Leghorn male with Cuckoo Leghorn females, but it appeared that the parents were not from pure breeding strains.

From an attempt to sex White Leghorn chicks by the rudimentary sexual organ in the vent of males, it was concluded that the organ was not sufficiently distinct at hatching but was quite apparent at six weeks of age. Ducklings were accurately sexed at hatching by examination of the vent.

An attempt to cross hare and rabbit, J. Hammond and A. Walton (*Jour. Genetics, 20 (1929), No. 3, pp. 401–404*).—The negative results of numerous attempts to artificially fertilize rabbit does with semen taken from hares are given. The attempts at artificial fertilization were made in the fall and spring because it appeared that the hare did not produce normal active sperm in the fall. The average weight of the testes of the hares was 1.8 gm. in October and 10.8 gm. in April.

A mathematical theory of natural and artificial selection.—Part VII, Selection intensity as a function of mortality rate. Part VIII, Metastable populations, J. B. S. Haldane (*Cambridge Phil. Soc. Proc., 27 (1931), No. 1, pp. 131–136, fig. 1; pp. 137–142, fig. 1*).—In continuing this series (E. S. R., 63, p. 326) the results are given of a statistical study of these phases of the natural selection problem.

Thyrogenous dwarfism (Myxoedema infantilis) in the domestic fowl, W. Landauer (*Amer. Jour. Anat., 43 (1929), No. 1, pp. 1–43, figs. 19*).—A careful description is given of the anatomy of a thyrogenous dwarf Rhode Island Red pullet observed at the Connecticut Storrs Experiment Station, together with comparative measurements of the skeletons of five similar birds observed at the Kansas Experiment Station.

The effect of temperature on the survival in vitro of rabbit spermatozoa obtained from the vagina, J. Hammond (*Jour. Expt. Biol., 7 (1930), No. 2, pp. 175–195, fig. 1*).—Semen was collected from the vaginas of female rabbits after mating with several bucks. The semen was held at different temperatures and at different intervals it was used for artificially inseminating other does previously bred to vasectomized bucks. Young were obtained when the semen was stored for 14 hours at 35° C., 96 hours at 10°, and 16 hours at 0°. The average size of litter also decreased with the time the spermatozoa were kept outside the body, but the average birth weight of the young in the small litters increased and the duration of pregnancy slightly increased. The motility of the sperm as observed under the microscope was found to be a good indication of the fertility. The sex ratio was not influenced by the temperature treatments given the spermatozoa.

The survival of the spermatozoa removed from the vagina is compared with the time of survival at the different temperatures of sperm removed from the epididymis and observed under paraffin oil by Walton, as reported in the paper below. It was found that the sperm removed from the epididymis and kept under paraffin at 10 and 0° C. survived longer than spermatozoa removed from the vagina and exposed to air in tubes.

The effect of temperature on the survival in vitro of rabbit spermatozoa obtained from the vas deferens, A. WALTON (*Jour. Expt. Biol.*, 7 (1930), No. 2, pp. 201–219, figs. 3).—The influence of temperatures of 0, 5, 10, 15, 20, 30, 37, 40, and 45° C. on the storage under paraffin oil of spermatozoa removed from the epididymis of rabbits was studied. It was found that the period of survival increased as the temperature was raised above 0° C. to a maximum of about 7 days at 15°. As the temperature was further increased, the period of survival was rapidly reduced until at 45° C. the sperm were almost instantly destroyed. The rate of destruction of the sperm was described by a semilogarithmic curve. Comparison with other attempts to preserve spermatozoa indicates that the lowering or prevention of the gaseous exchange by keeping the semen under oil is responsible for the ability of the sperm to fertilize ova for a longer period.

Although the sex ratio of the offspring produced by females artificially fertilized with semen that had been stored showed a progressive increase in the percentage of males with the increase in the length of the storage period, departure from equality was not considered significant.

The male hormone, C. FUNK, B. HARROW, and A. LEJWA (*Amer. Jour. Physiol.*, 92 (1930), No. 2, pp. 440–449, fig. 1).—A study of the urine of young men showed that alcohol extracts from fatty acid fractions contained a hormone which induced comb growth in capons upon injection after the comb and wattles had retrogressed and ceased to change as a result of castration. Extracts of pig testicles produced similar although less marked effects. Administration of the male hormone from this source, per os, produced some results, but the effect was less pronounced and less constant. A notation indicates that the hormone could be extracted to best advantage from urine made strongly acid by hydrochloric acid, and that impurities might be removed by a double precipitation with ether. The final product could be sterilized without injury to its activity.

Studies on the uterus, I–IV (*Amer. Jour. Physiol.*, 92 (1930), No. 2, pp. 420–429, figs. 5, pp. 430–435, figs. 2; 94 (1930), No. 3, pp. 696–704, figs. 3, pp. 705–707).—Results of the following studies are reported:

I. *A method for recording uterine activity in chronic experiments on unanesthetized animals*, S. R. M. Reynolds.—A method is described for recording uterine activity in the unanesthetized rabbit, and data on the normal uterine activity of four nonpregnant rabbits are given, which show unexplained variations in the type of activity in the same individuals at different times.

II. *Responses of the non-gravid uterus of the unanesthetized rabbit to pituitrin and pitocin*, S. R. M. Reynolds.—It is pointed out that in the active uterus following pituitrin administration there is a period of relative inactivity. The results with pitocin differed in that marked or accelerated activity is resumed immediately after initial tetanus.

III. *The activity of the uterine fistula in unanesthetized rabbits following coitus and during pseudopregnancy*, S. R. M. Reynolds and M. H. Friedman.—Female rabbits prior to coitus were found to exhibit marked or moderate uterine activity, although feeble activity preceding coitus was observed in 2 of 12 aminals. During the 10-hour period following coitus, uterine activity decreased and the uterus remained relatively quiescent until the fifteenth or twentieth day of pseudopregnancy.

IV. *The response of the uterine fistula of the unanesthetized rabbit to the injection of the urine from pregnant women*, S. R. M. Reynolds and M. H. Friedman.—Decreased uterine activity followed the intravenous injection of urine from pregnant women into female rabbits, but the urine from nonpregnant women did not bring about any change in the uterine activity.

On the problem of "parthenogenesis" in the mammalian ovary, O. F. Kampmeier (*Amer. Jour. Anat., 43 (1929), No. 1, pp. 45–76, figs. 11*).—In connection with experiments on intraovarian fertilization in dogs it was found in 24 ovaries examined that, as in other animals, there was a widespread destruction of follicles which was related to the oestrous cycle. Different characteristics of atresic follicles are described, and it is pointed out that in some cases the position of the nucleus near the periphery suggests the necessary steps toward polar body formation, although no maturation spindles were found. Among many thousand degenerating cells there were a very few which resembled more or less closely early cleavage stages of the fertilized ovum, containing 2, 3, 4, or more blastomeres or cell heaps that are morula-like.

Variations in these conditions are noted. It is pointed out that they can not be considered as cases of parthenogenic development, and nothing was observed comparable to the parthenogenic origin of chorionepitheliomas and teratomas.

A biochemical investigation into the function of corpus luteum.—A study of blood sugar and nonprotein nitrogen changes in rabbits after the administration of corpus luteum, G. V. S. Smith and O. Watkins (*Amer. Jour. Physiol., 94 (1930), No. 3, pp. 586–596*).—Reactions in increased blood sugar and nonprotein nitrogen were irregularly observed in nonpregnant, pregnant, lactating, and spayed does and normal bucks to intraperitoneal injections of corpora lutea extract. It was fonnd that normal does reacted regularly to the injections from 34 hours to 4 days after copulation, but spayed animals showed no reaction. Animals must come under the influence of folliculin before the corpora lutea extract is effective.

Studies on the physiology of reproduction in birds.—XXVII, The age distribution of mortality in bird embryos and its probable significance, O. Riddle (*Amer. Jour. Physiol., 94 (1930), No. 3, pp. 535–547, fig. 1*).—In continuing this series (E. S. R., 62, p. 825), data are reported on the embryonic mortality in ring doves, wild doves, and common pigeons. In conformity with the findings of L. F. Payne,[1] there were found two stages of heavy mortality in fowls. One was early in the incubation period at about the third or fourth day, and the other occurred during the final two or three days of incubation. The mortality early in incubation appears to be related to failure in the respiratory adjustment, while the heavy mortality just before hatching appears to be associated with a deficient water supply.

The relation of gonadal condition to erythrocyte number in fowls, M. Juhn and L. V. Domm (*Amer. Jour. Physiol., 94 (1930), No. 3, pp. 656–661, fig. 1*).—Erythrocyte counts were made at intervals from hatching to 16 months of age on 40 males and 40 females, and it was found that males showed higher counts than females at maturity. Gonadectomized and young birds showed counts similar to females. When the functional ovary was removed from females and the other ovary permitted to hypertrophy into the testis-like organ, the erythrocyte count closely approximated that of the male.

Time of development of the different sexual forms in Drosophila melanogaster, T. Dobzhansky (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 59 (1930), No. 1, pp. 128–133*).—A comparison of the developmental periods of the different sexual types of Drosophila showed the variation to be as follows: Diploid females 199.24±0.49 hours, triploid females 203.88±1.29, males 205.20±0.98, intersexes 255.76±0.82, superfemales 251, and supermales 272.72±2.12 hours. There thus appeared to be no correlation between the length of the developmental period and the sex-determining ratio.

[1] Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 6 (1919), p. 9.

The potency of blood serum of mares in progressive stages of pregnancy in effecting the sexual maturity of the immature rat, H. H. Cole and G. H. Hart (*Amer. Jour. Physiol., 93 (1930), No. 1, pp. 57–68, figs. 2*).—A study of the potency of the blood from 62 mares as a source of the female hormone by injection into immature rats is reported from the California Experiment Station. This study showed that the blood serum from nonpregnant mares gave negative results as regards stimulation of growth in the ovaries and other genital organs. As pregnancy advanced to the thirty-seventh to the forty-second day, growth in the ovaries of the rats was stimulated, reaching a maximum at about the eightieth day of pregnancy in the mares. At later stages of pregnancy the reactions to the injections of the serum were confined mainly to changes in the uterus and vagina.

A high correlation was observed between the period of high concentration of anterior hypophyseal hormone in the serum and the time of implantation in the mare.

It is concluded that the presence of the anterior hypophyseal sex maturing hormone in the blood stream of pregnant animals may be used as the means of diagnosing pregnancy at from 6 to 7 weeks.

Sex hormones in the blood serum of mares.—II, The sera of mares from the 222nd day of pregnancy to the first heat period post-partum, H. H. Cole and G. H. Hart (*Amer. Jour. Physiol., 94 (1930), No. 3, pp. 597–603, figs. 2*).—In continuing the above studies the sex hormone content of the blood serum of mares was studied from the two-hundred-and-twenty-second day of pregnancy until the first postpartum heat period. Doses of 25 cc. or more gave uniformly positive results until approximately the end of the gestation period, but serum taken after parturition produced no reaction.

FIELD CROPS

[Field crops experiments at the Alaska Stations, 1929], H. W. Alberts (*Alaska Stas. Rpt. 1929, pp. 7, 8, 11–17, 18, 24–29, 37, figs. 4*).—The progress (E. S. R., 62, p. 127) is reported of variety tests with spring and winter wheat, oats, barley, rye, seed flax, potatoes, alfalfa, clover, vetch, field peas, grasses, sunflowers, and miscellaneous forage and silage crops.

Seed from grain of the 1928 crop, kept over winter in an unheated granary at Fairbanks, gave a rather high germination in the summer of 1929, especially the early and mid-late varieties. Seed flax seemed to be adapted to the local conditions. A method found suitable for curing grain hay is outlined. Burning the dead grass early in the spring, the Kodiak Station found, increases the stand.

In rotation experiments at Matanuska, the respective average acre yields on continuously cropped and on rotated plats were for wheat grain 18.2, 21.5 bu.; wheat straw 0.8, 0.8 ton; peas, green forage 9.6, 10.8 tons; barley grain 28.4, 32.8 bu.; barley straw 0.7, 9.9 tons; oats and vetch, green forage 7, 6.8 tons, and dried hay 2.1, 2.4 tons; and potatoes 159.2, 195.5 bu. Yields from crops in rotation were consistently higher except with oats and vetch forage.

Calcium chlorate was used effectively on small areas at Fairbanks, one sprinkling of powder sufficing to kill horsetail, lamb's-quarters, wild barley, and larkspur. Its cost, however, practically prohibited its use on large areas. Lamb's-quarter, experience at Matanuska showed, could be almost completely eradicated from badly infested grain fields if the grain is cut for 2 years in succession soon after the heads emerge and is used for soiling or silage purposes.

[Field crops research in Oklahoma, 1926–1930], H. J. Harper, H. F. Murphy, C. B. Cross, B. F. Kiltz, J. C. Ireland, H. W. Staten, L. L. Ligon,

G. W. Cochran, R. W. Ellithorp, and H. H. Finnell (*Oklahoma Sta. Rpt. 1927–1930, pp. 28–70, 228, 229, 294–322, 323–325, 327, figs. 5*).—Investigations with field crops (E. S. R., 57, p. 523) at the station and elsewhere in the State, reviewed for the above period and not detailed below, included variety tests with cotton, wheat, oats, corn, barley, rye, grain sorghum, sorgo, soybeans, cowpeas, alfalfa, miscellaneous forage grasses, mangels, and sugar beets; breeding work with cotton, wheat, barley, oats, and grain sorghum; seeding trials with wheat, barley, grain sorghum, soybeans, cowpeas, and alfalfa; seed treatment of oats for smut control; and fertilized crop rotations.

Manured wheat averaged for 32 years 20.67 bu. per acre and unmanured 12.39 bu. Preparation with a one-way disk, which required less power, resulted in a 3-year average acre yield of 12.9 bu., and with a Killefer chisel 10.3 bu. In studies of methods of handling grain straw, plowing early where the straw had been burned resulted in the highest wheat yield and plowing under the straw early came next. Comparison of moisture conserved by treatments after wheat harvest indicated that the stubble should be disked immediately after harvest even though no weeds or grass are present. Mowing or burning the straw also reduced the rate of evaporation. The influence of fertilizers on wheat has been described elsewhere by Murphy (E. S. R., 64, p. 536).

Wheat in cultural and rotation studies at Goodwell averaged 16 bu. per acre after summer fallow, after other crops in rotation 14.3, and continuously 11.3 bu. As its yields indicated, wheat preferred preceding crops in the order cowpeas, corn, spring grain, milo, and wheat. The grain yield of milo showed that the kind of previous crop is of less importance than the preparation and spacing. Fall listing or plowing in preparation produced consistently higher yields of milo. Cowpeas did uniformly well following a cultivated row crop, but the yields fell to unprofitable levels where cowpeas followed any kind of broadcast seeding, including small grains and sorghums grown for hay without cultivation. Sudan grass made unsatisfactory yields when grown continuously on the same land, but it responded well to barnyard manure and rotation with row cultivated crops. Ideal rotations are indicated.

With crops following the grain sorghums no toxic effect appeared in fertile soils, and in soils low in organic matter better growth of sweetclover was secured after kafir than after soybeans. The yield of oats following Sumac sorgo, feterita, or darso was affected most by variations in soil fertility. Chemical studies indicated that the roots and stalks of the grain sorghums, except the stalk of feterita, are lower and the leaves higher in total nitrogen than in the same organs of corn. In water-soluble nitrogen feterita was higher than corn, while Sumac sorgo and darso were lower, except cornstalks which were very low in water-soluble nitrogen. While the toxic effect of the grain sorghums as compared with corn could not be explained satisfactorily on the basis of variations in chemical analyses, it is pointed out that since they continue to grow so much later in the fall than corn, bacteria and fungi have less time to reduce the carbohydrate residues before the next crop is planted. The large quantity of partly decomposed organic matter remaining in the soil markedly affects the available nitrogen in the soil, and when nitrogen is a limiting factor in crop production, a decrease in crop yield is inevitable. Grain sorghums planted in 3.5-ft. rows and harvested for seed reduced the yield of the following crop less than when planted in 1-ft. rows and harvested for forage.

Inheritance studies with sorghum indicated that length of seed branches and the circumference of heads might be associated closely with high yields, while the length of the stalk had little to do with the grain yield. Chlorophyll deficiency in the sorghums seemed of minor importance in inheritance.

Kafir in which weeds were allowed to grow averaged 15 bu. per acre, with weeds scraped off 21.2, three shallow cultivations 21.6, three deep 20.6, five shallow 22.1, and five deep cultivations 19.7 bu., indicating that shallow cultivation for weed control is most effective and most economical.

Experiments with White Rice pop corn showed that as much as 6 per cent of moisture could be added to pop corn of minimum moisture content at one time without injury to the grain. The popping volume was greatest when the moisture had been increased to about 13.5 per cent.

Level planting of cotton about May 10 seemed optimum for north central Oklahoma and in shallow furrows between May 1 and June 10 in southwest Oklahoma. Spacing tests at the station were inconclusive, while hills 18 to 24 in. apart, with 1 to 3 stalks per hill, were indicated at Granite. Cultivated plats did not differ widely at Granite, averaging 1,019 lbs. of seed cotton per acre compared with 840 for hoeing only, and 294.5 for no cultivation.

Oklahoma Triumph 44 varied in breaking strength per square inch of cotton cellulose from 30,100 lbs. for lint from the poorest land to 40,650 lbs. from medium land and 58,100 lbs. from good land, indicating that plant food nutrients as well as water are required for quality in cotton fiber. Fiber from fertilizer tests did not show conclusive evidence of quality improvement over checks. Cotton from bottom land was decidedly superior in quality to that from upland soil. Cotton treated with moisture (65 per cent relative humidity for 12 hours) broke from 2,000 to 3,000 lbs. stronger than bone-dry cotton, indicating the advantage of a conditioned sample. Five bales picked while cotton was in its prime graded strict middling with a 1⅛-in. staple and averaged 81,506 lbs. breaking strength, whereas 5 other bales grown under like conditions, but picked after several weeks of rain and graded strict low middling with the same staple, broke at 77,296 lbs. The results showed that cotton left in the field deteriorates, i. e., starts breaking down and becomes weaker. In tests on samples from a number of cottons, the varieties having the longest staple usually were the strongest. Varieties stapling 1 in. and above were stronger than those with a staple less than 1 in. The technic of the strength tests is discussed briefly.

Spinning tests on picked and snapped cotton of the 1926 crop, in cooperation with the U. S. Department of Agriculture, indicated that snapping as a harvesting method lowers the grade of the cotton. The increase in waste of snapped cotton over corresponding picked cotton was reflected in the lower grade. However, no appreciable difference seemed to exist in the strength of the yarns spun from the picked and snapped cotton of the same variety grown under the same conditions. The uniformity of the yarns spun from picked and snapped cotton did not differ significantly, and there was practically no difference in the running qualities of cotton harvested by the two methods. There was a consistent slight decrease in the strength of 22s and 28s yarn spun from picked cotton grown in northern Oklahoma from the first to the second and from the second to the third picking, this decrease possibly being caused by exposure to weather.

Potato seed from the spring crop, exposed to light 3 weeks in tree shade, gave better stands than those directly from the field or from storage. Of the treated lots, bruised tubers gave highest yields, chemically treated next, and sun-cured potatoes third. Northern grown potatoes held in storage until around July 1, shipped to Oklahoma, and held in cold storage until 10 days before planting, when planted whole yielded about twice as much as the other treatments, whereas most of the cut tubers rotted.

Fertilizer tests with alfalfa in central and eastern Oklahoma showed that, on soils in a favorable physical condition but low in available plant food, the addition of organic matter as green manures, barnyard manure, or straw did

not produce appreciable increase in yield over plats receiving only mineral fertilization. Low availability of soil phosphorus seemed to be the chief limiting factor in alfalfa production. Fertilization with from 150 to 200 lbs. of superphosphate per acre annually is indicated. Where soils were deficient in phosphorus farm manure had little effect except at very high rates per acre. The largest increases in yields were secured from the combination of farm manure and superphosphate applied in the spring as a top-dressing on the alfalfa sod. Limestone was needed on many soils for maximum production of alfalfa, and except on the most acid soils it had a greater influence on holding the stand than in increasing crop growth during the first or second season. Complete fertilizer (2-12-6) produced slightly larger yields on some soils than an equivalent amount of superphosphate. Tests in west central Oklahoma indicated that the chief limiting factors in alfalfa production in that area were soil-moisture conditions and plant diseases.

One-half of an area of 520 acres on 101 Ranch was grazed continuously by cattle during the growing season, and the other half subdivided into thirds was used as a rotation pasture by an equal number of cattle. The weed content of the continuous pasture rose from 13 per cent in 1927 to 45 in 1929 and the rotated area from 16.4 to 29.2 per cent. The rotated pasture was in much better condition than the continuous pasture, more grass being left on the ground in the rotated area, which insured more vigorous root development, and the beef production somewhat favored the rotated pasture.

A cereal variety survey of Oregon, D. D. Hill (*Oregon Sta. Circ. 97 (1930), pp. 16, figs. 4*).—From questionnaires sent to growers of the 1929 crop, 43 varieties of wheat, 36 of oats, and 13 of barley were reported. In eastern Oregon the leading varieties and their percentage of the area of their crop were for wheat Federation 33.2 per cent, Hybrid 128, 28.4, Turkey 21.5, and Fortyfold 13.2; oats Markton 44.2 and Swedish Select 20.5 per cent; and barley Trebi 51 per cent and beardless (probably Meloy or Union Beardless) 26 per cent. In western Oregon the leaders and percentages were wheat Holland 21, White Winter 18, Jenkin 14.8, and Rink 12.2; oats Gray Winter 56, Three Grain 13.1, and Eclipse 5.7; and barley Hannchen 69.9, winter barley 11.8, and O. A. C. No. 7, 6.3 per cent. The results of the growers' survey with wheat were confirmed closely by data from warehouses in the Columbia Basin counties.

Top-dressing old pastures, F. S. Prince, P. T. Blood, and G. P. Percival (*New Hampshire Sta. Circ. 35 (1931), pp. 12, figs. 4*).—Plats in selected pastures in most of the counties in New Hampshire were variously fertilized and limed in 1929 and 1930, and the forage usually was harvested with a lawn mower with a grass catcher from one to four times per season.

The results showed that the better areas of permanent pasture would respond profitably to fertilizer, the response from different elements being governed somewhat by the vegetation and the soil. Some pastures, containing practically only grasses, responded more to nitrogen, whereas when a partial stand of white clover was in the pasture at the time of top-dressing, good response was had from potash, phosphorus, and lime. Supplying plant food tended quickly to stimulate Kentucky bluegrass and bentgrasses and on the heavier soil types white Dutch clover, crowding out the undesirable species.

For lighter soils with little or no white clover, recommendations are for an initial spring application of 300 to 500 lbs. of 10-16-14 or 8-16-16 fertilizer to serve for three or four years and followed each spring with 200 or 300 lbs. of sodium nitrate or its equivalent per acre. Pasture with considerable white clover should receive on part of the area the same initial application if early feed is needed. For other areas and if early feed is not required, top-dressing once in three years with 500 to 600 lbs. of 16 per cent superphosphate and 200

lbs. of potassium chloride is advised. Liming evidently should be delayed until other plant-food needs are met.

Results of cotton variety tests in Alabama for the period 1925–1929, inclusive, H. B. TISDALE and J. T. WILLIAMSON (*Alabama Sta. Circ. 56 (1930), pp. 3*).—Cotton varietal leaders in tests in different localities in the State were about the same as those noted earlier (E. S. R., 62, p. 732). High-yielding cottons consistently producing a staple of ⅞ in. or longer in north Alabama were Cook 1627, D. & P. L. 4–8, Delfos, and Trice; in central Alabama Cook 1627, D. & P. L. 4–8, and Dixie Triumph; and in south Alabama the wilt resistants Dixie Triumph, Cook 307 (Rhyne), and Toole (Council).

Varieties of cotton for north Texas, P. B. DUNKLE (*Texas Sta. Bul. 417 (1930), pp. 31*).—Comparative tests of cotton varieties at the Denton Substation during the period 1913 to 1929 showed the leaders in average acre yields of lint to include Half-and-Half with 283 lbs., Sunshine 248, New Boykin 239, Harper 238, and Cliett Superior 236 lbs. Half-and-Half had the highest average yield and the highest lint percentage, 41.5 per cent, but also had certain objectionable features, such as small bolls and a short staple averaging ¾ in. and untenderable on future contracts. The better staple varieties such as Sunshine, New Boykin, Harper, and Cliett Superior were big-boll, storm-proof varieties with lint percentages ranging from 34 to 39.4 and producing staple of tenderable length, averaging 31/32 to 1 in. The varieties other than Half-and-Half are indicated where suitable prices are paid for their better staples.

A biometrical analysis of upland cotton grown at Stillwater, Oklahoma, F. GRIFFEE, L. L. LIGON, and L. H. BRANNON (*Oklahoma Sta. Bul. 187 (1929), pp. 32*).—Measurements and records were made for 24 characters on 19 cotton varieties in 1926 and 25 characters on 18 varieties in 1927. Correlations were calculated with particular reference to the economically important characters, yield of seed cotton, lint percentage, lint length, and number of bolls per pound of seed cotton.

Characters of importance in their association with yield of seed cotton in 1926 were length of stem internode, area of the largest leaf, number of vegetative branches, lint length, lint percentage, and lint yield. The multiple correlation of these characters with yield was 0.9421±0.0174 and without the lint yield included 0.7661±0.0639. Characters found of interest as to their relations to yield in 1927 were the date of first flower, the time to mature, area of the largest leaf, plant height, number of squares at first flower, and number of flowers on at 18 days. Their multiple correlation coefficient with yield as the dependent variable was 0.9565±0.0134, and omitting time to mature and plant height 0.9423±0.0179.

Characters of interest as to their association with lint percentage in 1926 were date of first flower, number of bolls on fruiting branches, yield of seed cotton, and lint length. These four characters with the lint percentage as the dependent variable had a multiple correlation of 0.5926±0.1003. Only the date of the first open boll, lint length, and number of bolls per pound were of importance in respect to lint percentage in 1927, the multiple correlation therewith being 0.8379±0.0473.

Lint length in 1926 was associated to some degree with height to first branch, yield of seed cotton, lint percentage, weight of 100 seeds, and time to mature. In 1927 only lint percentage and time to mature appeared of importance from the viewpoint of lint length.

Of the five characters in 1926 and nine in 1927 which were important in their associations with number of bolls per pound of seed cotton, the height to first branch, area of largest leaf, weight of 100 seeds, and number of locks per

boll were significant in their correlations in both years. The multiple correlation coefficient with the five variables and number of bolls per pound was 0.9936±0.0019 and with the nine variables 0.9272±0.0224.

Scatter diagrams for the interrelations of the characters yield of seed cotton, lint percentage, lint length, and number of bolls per pound for 1927 suggested that these characters are not associated closely except for lint length and lint percentage. In advancing the lint length beyond 1$\frac{1}{16}$ in., evidently a reduction in the lint percentage must be expected.

Methods of ginning in relation to the grade and staple of cotton, D. T. Killough and G. T. McNess (*Texas Sta. Bul. 416 (1930), pp. 32, figs. 10*).—Cotton of different lengths of staple was ginned from 1926 to 1929 in a two-stand, 70-saw, air-blast gin under varying conditions of saw speed and breastroll density, with and without the use of the standard air-line cleaner to determine the effects of such conditions upon the grade and staple.

Tests with medium staple cotton (Truitt, ⅞ to 1 in.) showed in general that the standard air-line cleaner improved the grade of the fiber and the style of ginning, although in most cases by removing the dirt and trash it slightly reduced the lint percentage as compared with cotton not cleaned. The cleaner did not appear to affect appreciably the lint length or the time required for ginning and is deemed a profitable attachment.

Increase in the speed of the saws from 640 to 760 and 840 r. p. m., provided the loose breastroll was used, did not seem to affect significantly the grade, lint length, gin cutting of the lint, or the condition of the seed when cottons ranging from ⅞ to 1⅝ in. in staple were used. The style of ginning apparently was not affected when the saws were operated at 640 and 760 r. p. m., but at 840 r. p. m. it was slightly lower in a few instances. Increasing the speed of the saws seemed to reduce the time required in ginning when a loose breastroll was used. The loose breastroll generally gave better results with all staple lengths than did medium or tight breastrolls. Increase in the density of the breastroll appeared to lower the grade and the style of ginning, to increase gin cutting, to prolong ginning time, to damage the seed, and in some cases to lower lint percentage.

In general a saw speed of 760 r. p. m., used together with the loose breastroll and the standard air-line cleaner, evidently provided the most favorable conditions for ginning cotton on the air-blast type of gin.

Kudzu in Alabama, R. Y. Bailey and E. L. Mayton (*Alabama Sta. Circ. 57 (1931), pp. 10, figs. 3*).—The merits of kudzu for hay, grazing, and soil improvement are described, and its cultural, soil, and fertility needs are outlined. See also an earlier note by Pierre and Bertram (E. S. R., 62, p. 520).

During six years, kudzu unfertilized averaged more than 2 tons of hay per acre. In cutting tests the highest average yields came from a plat cut June 1 and August 15 and from one cut June 1 and October 15, the yields declining less rapidly on the latter plat. Following kudzu turned under in 1919, the average yield of two crops of a sorghum hay was increased by 2,536 lbs. per acre, four crops of corn by 19.3 bu., and seven crops of oats by 7.9 bu. The plant appeared to respond well to phosphorus and to manure. Kudzu did not seem to be a dangerous weed pest, since its spread to adjacent land was prevented easily and because cutting tests showed that it could be eradicated by close grazing followed by plowing.

Sweetclover in Corn Belt farming, M. A. Crosby and L. W. Kephart (*U. S. Dept. Agr., Farmers' Bul. 1653 (1931), pp. II+26, figs. 7*).—Cultural methods and field practices considered essential to success with sweetclover in the Corn Belt are outlined, and information is given on the utilization of the crop for

pasture, soiling, bee forage, soil improvement, hay, and seed production, and its place in rotations on grain farms for soil improvement and in cropping systems on grain and livestock farms. This publication is a revision of and supersedes Farmers' Bulletin 1005 (E. S. R., 40, p. 242).

St. Johnswort on range lands of California, A. W. SAMPSON and K. W. PARKER (*California Sta. Bul. 503 (1930), pp. 48, figs. 23*).—The characteristics, anatomy, distribution, habitat, losses to livestock and in forage production, and natural enemies of St. Johnswort (*Hypericum perforatum*) are described, with accounts of experiments on mechanical and chemical methods of control and practical suggestions. St. Johnswort, also known as Klamath weed, is the most serious pest found on ranges and pastures of northern California and occupies more than 100,000 acres of choice pasture lands of the State. It is poisonous to livestock, but losses by death have not been serious. The heaviest losses were caused by the poor condition of health and flesh of the animals grazed upon infested areas and by the serious decline in grazing capacity. This weed crowds out the clovers and practically all the grasses of a high forage value.

None of the mechanical methods employed to eradicate and control the plant as digging, cutting, covering, flooding, burning, and overgrazing was effective. Climate is the only natural enemy limiting its spread. Temperature and precipitation are limiting factors in the rate of spread of the plant on local areas and in determining the elevational range.

Sodium chlorate and a commercial mixture of about equal parts of sodium chlorate and calcium chloride were the most effective chemicals tested. Suggested solutions are 1¼ lbs. of sodium chlorate or 1⅔ lbs. of the mixture per gallon of water, with 1 tablespoonful of glue as a spreader and ¼ teaspoonful of sulfuric acid per gallon. Spraying in early spring and in autumn is said to be considerably more effective than in late spring when the flowers are in the late bud stage or when the plants are in early bloom. Prevention of seeding by using clean hay, clean seed, and uninfested manure, and destruction of the weed along roads and waterways is advised. The control and destruction of large infestations is a problem yet unsolved.

HORTICULTURE

[Horticultural investigations at the Alaska Stations], H. W. ALBERTS (*Alaska Stas. Rpt. 1929, pp. 4, 7, 8, 9, 11, 17, 18, 23, 24, figs. 3*).—This report as usual (E. S. R., 62, p. 137) consists largely of brief notes on the results of varietal and cultural tests with horticultural crops. The Yellow Transparent apple matured some fruit of fair quality. An examination of the root system of a 24-year-old Lowland Raspberry apple tree showed the system to be very shallow, the horizontal roots being less than 1 ft. from the surface. Grapes failed to fruit in the open because of winterkilling of canes even when covered. Certain of the hybrid strawberries developed at the Sitka Station proved promising. The hardiest types of vegetables, such as cabbage, peas, and turnips, were again very successful. At the Fairbanks Station, Cuthbert raspberries and strawberries overwintered safely when mulched. Early types of vegetables thrived, but tomatoes failed to ripen any fruit outdoors. Notes are presented on the condition of various fruit species planted in the spring of 1929 at the Matanuska Station.

[Horticultural investigations at the Oklahoma Station] (*Oklahoma Sta. Rpt. 1927–1930, pp. 212–228, 229–231, figs. 5*).—This report, covering the period July 1, 1928, to June 30, 1930, presents a general summary of progress. As found by D. V. Shuhart, top-working native pecan trees is impractical as com-

pared with actually cutting down the trees and budding the resulting sprouts. Exposed to a winter minimum of −17° F., many varieties of pecans, including Halbert, Van Deman, Texas Prolific, and San Saba, were seriously injured. Of large fruited varieties, Stuart showed the least injury. Persian [English] and Japanese walnuts suffered severely. As reported by F. B. Cross, early ripening apples such as Yellow Transparent and Star are more valuable than later varieties which have to endure the usual summer drought. In spraying investigations, lubricating oil emulsion was found more economical and effective than lime sulfur for the control of San Jose scale. A combination of spraying, trapping, and banding gave good control of codling moth. Permanent alfalfa was found undesirable as a soil treatment for orchards. The modified leader system proved satisfactory for training fruit trees. Applications of soluble nitrogen about three weeks before growth began in the spring increased the set of fruit. In a test of some 100 varieties of peaches, Mamie Ross, Carman, J. H. Hale, Elberta, Belle, and Salwey freestones and Redbird, Superb, Golden Sweet, and Chinese clingstones proved best. Heath was found unproductive and nonvigorous. A list of promising plums is also given. Dry mix lime sulfur controlled brown rot on both peaches and plums. No apricot proved satisfactory. The Dyehouse, Early Richmond, and Montmorency cherries are conceded the best varieties. Among pears, Kieffer, Lincoln, Garber, and Seckel are deemed best.

As reported by E. F. Burk, certain vegetables were found well adapted to Oklahoma conditions. Among the rather unsuccessful species are listed cauliflower, celery, head lettuce, and peas. Sweetpotato varieties were improved by selection.

In tests conducted by G. W. Cochran, currants and gooseberries proved generally unsatisfactory. The Early Harvest blackberry was found desirable. Pollination tests with self-unfruitful McDonald showed Early Harvest pollen to be compatible, but unfortunately the blooming seasons did not concur completely. Dallas pollen was not satisfactory for McDonald. Raspberries failed. Dunlap, Aroma, and Big Joe strawberries proved desirable.

According to Cross, only 2 of 85 grapes, namely Wine King and America, withstood the −17° temperature in 1929–30. Satisfactory location and good growth assisted peaches to produce satisfactory crops. Peach buds on the lower third of the shoots produced most of the fruit two years out of three. Soil treatment failed to influence materially the time of blooming of the peach. Uneven ripening of the berries in the Concord grape was found by Cross to be decreased with proper pruning and culture. The number of buds to be left per grapevine should accord with the vigor. Partial shading was not helpful in reducing uneven ripening and retarded ripening in some cases. Water had the same effect as shading. Spraying with an oil emulsion did not lessen the trouble. Girdling did not prove helpful, but did increase the size of berries and of clusters. The four-arm Kniffin system of training proved best. Cultivation followed by a cover crop after harvest is advised. In cooperative studies at Henryetta no difference except in cost of operation was found between the Kniffin and Munson systems of training grapes. Meritorious grapes included Niagara, Concord, Extra, Bailey, Meunch, Lenoir, Ellen Scott, Last Rose, Headlight, and Captivator. Oil sprays applied to both the upper and lower surfaces of leaves reduced the water loss from apple trees growing in sealed pots by 23 per cent and the loss from grapevines by 17 per cent.

According to Cochran, pruning, cultivation, and spraying restored an unprofitable farm orchard to a profitable condition. In experiments near Perkins, applications of a 4–8–4 fertilizer at the rate of 500 to 800 lbs. per acre gave the best results with potatoes and tomatoes.

The quality of packet vegetable seed on sale in New York in 1929 and 1930, M. T. Munn, O. H. Sipple, and M. E. Woodbridge (*New York State Sta. Bul. 587 (1930), pp. 27*).—Conforming to the series of related bulletins (E. S. R., 61, p. 441), the results are herein presented of germination and quality tests of 624 packets of vegetable seed collected from dealers in 1929 and 1930. About 3 per cent of the packets contained worthless seed, 5.4 per cent contained seeds of little value, and another 38.3 per cent were below reasonable standards of quality, leaving only 53.3 per cent that conformed with or were superior to accepted standards.

Fertilizing tomatoes, sweet corn, and muskmelons in a three-year rotation, J. W. Lloyd (*Illinois Sta. Bul. 364 (1931), pp. 18, figs. 3*).—Fertilizer experiments with tomatoes, sweet corn, and muskmelons grown in a three-year rotation on a fertile dark-colored silt loam soil failed to develop a satisfactory system of fertilizing in which commercial fertilizers and cover crops could be entirely substituted for stable manure. On the soil used, some of the ingredients were actually harmful. For example, potassium fertilizers decreased the yields of melons and were of little or no benefit to tomatoes and sweet corn. Nitrate of soda and dried blood decreased the yields of melons and corn, and ammonium sulfate decreased the yields of all three crops. Phosphorus gave good results with tomatoes, especially when used in the form of steamed bone meal and without manure. A complete commercial fertilizer made up of steamed bone meal, dried blood, and potassium sulfate used without manure or cover crop increased the yields of tomatoes and corn 40 and 27 per cent, respectively, above checks, but decreased the yields of melons by 24 per cent. Limestone used with manure increased the yields of tomatoes, sweet corn, and melons 7, 14, and 25 per cent, respectively, above yields obtained with manure alone. A practical method of fertilizing these crops when grown together in rotation is outlined.

Early sweet corn variety trials, 1929, R. Magruder (*Ohio Sta. Bimo. Bul. 148 (1931), pp. 18–24, figs. 2*).—Supplemented with discussion, data are presented on the yields, time of ripening, bearing habits, size of ear, etc., of several varieties of white and yellow sweet corn.

A progress report on onion investigations in the Arkansas Valley, E. J. Allen (*Colorado Sta. Press Bul. 75 (1931), pp. 12*).—Based on two years' investigations, it is reported that the Valencia onion was the most productive variety found and also possessed good storing qualities. Colorado-grown Valencia seed was more productive than either California- or Spanish-grown seed. Transplanting did not give good results as compared with seeding, but is deemed of some promise for an early crop. Commercial fertilizer appeared promising as a supplement to manure. Curing from 7 to 12 days in the field under favorable weather conditions proved advisable, and no advantage was found in curing under cover if favorable outdoor weather prevailed. Close topping decreased storage decay but increased sprouting losses. Cull onions decayed and sprouted more than did graded stock. Storage losses from transplanted and seeded onions were approximately equal. Increased ventilation did not reduce storage losses or materially affect the temperature and humidity of the rooms.

Origin and nature of rogues in canning peas, E. J. Renard (*Wisconsin Sta. Research Bul. 101 (1930), pp. 56, pls. 8, figs. 9*).—Accepting rogues in peas as any of a comparatively wide range of heritable variations which are not a direct result of mechanical mixture or volunteer growth, the author reaches the general conclusion that the origin of these off types lies in natural crossing and stresses the importance of establishing single plant lines and keeping these pure by isolation. As evidence of natural crossing there was observed simple Mendelian segregation in the progenies of off-type seeds and plants appearing in a

number of pure lines of different canning varieties. On the other hand, the maintenance and increase of pure lines of Alaska, Perfection, and Surprise under isolated conditions gave evidence that natural crossing is likely the causal factor in rogue production. Crosses between similar lines of Alaska failed to give rise to rogues in the F_1 and F_2 generations, suggesting that Alaska rogues do not arise from crossing between type individuals.

High soil fertility with resulting high productivity did not give rise to off-type Alaska strains, nor was the habit of bearing two pods per flower stalk found associated with a tendency to off-type production.

The relation of seed formation to fruit development of the pear, O. S. H. Reinecke (*So. African Jour. Sci., 27 (1930), pp. 303–309, pl. 1, fig. 1*).—Noting that many pears, including such well-known varieties as Bartlett, Bosc, Clapp, and Kieffer, develop seedless fruits as a result of self-pollination, that some varieties develop seedless fruits without any pollination, and that in a variety orchard where pollination conditions were ideal there was a wide range in the number of seeds per fruit, a study was made of the relation of seeds to fruit development, chemical composition, behavior in storage, etc.

Asymmetry in shape was generally associated with incomplete fertilization of the ovules. Tissue development in improperly fertilized fruits was more prominent at the stem end. In the Smith Hybrid variety there was recorded a progressive increase in fruit weight as the number of seeds increased. In relation to keeping quality it was noted that seedless fruits soon developed a flat, yellowish red color and shriveled appearance as compared with bright color and firmness in seed-containing fruits. Chemical analysis of the pulp of both groups showed less acid, less reducing sugar, and higher insoluble solids in the seedless pears. There was a slight content of sucrose in the pears with seeds and none in the seedless. To the taste the fruits with seeds were sweeter and much more juicy. Because of the higher carbohydrate content osmotic pressure was believed to be higher in these fruits, a fact which aided in the retention of water during critical stages on the tree and hence firmness in storage. The presence of seed is presumed to inhibit gaseous exchange after picking. In concluding, the author asserts that seed content should receive greater consideration in interpreting results of fertilizer, pruning, and rootstock tests.

Identification of Mazzard and Mahaleb cherry rootstocks, H. B. Tukey (*New York State Sta. Circ. 117 (1930), pp. 12, figs. 7*).—This circular presents detailed descriptions of the tree, leaves, buds, flowers, and fruit of the Mazzard and Mahaleb cherries, and points out the distinguishing features of the roots. A simple chemical test for distinguishing roots is suggested based on the fact that iron salts give different color reactions with Mahaleb and Mazzard root tissue. The bark of the Mazzard root is said to be very bitter, whereas that of the Mahaleb, although not pleasant to the taste, is not bitter. An earlier paper on the chemical test was noted (E. S. R., 64, p. 540).

Some carbohydrate and nitrogen constituents of alternate-bearing Sugar prunes associated with fruit bud formation, L. D. Davis (*Hilgardia [California Sta.], 5 (1931), No. 6, pp. 119–154, figs. 12*).—Noting a very pronounced biennial bearing habit in the Sugar prune under prevailing conditions at Davis, Calif., chemical studies were made of bearing and nonbearing spurs with a view to determining the internal conditions associated with fruiting performance. In all types of material studied, the content on a dry-weight basis of reducing substances was in nonbearing trees below that of bearing trees from about May 1 onward through the growing season. Bearing wood was uniformly lower in total nitrogen from May 1 onward through the growing season. Starch was found consistently higher in the nonbearing trees and especially so after

the first flush of spring growth, leading to the conclusion that there is probably a considerable carbohydrate drain on the tree from the time the fruit buds form one year until the fruit is harvested the next.

Roots of bearing trees also contained a relatively small amount of starch, whereas those of nonbearing trees were high in starch. The author suggests that carbohydrates may be sufficiently limited in the roots of heavy-bearing trees to suppress root growth and thereby indirectly the intake of ions and water needed for fruit bud formation. Starch in itself is deemed probably unnecessary for fruit bnd formation, but may represent a nutritive condition of excess energy materials which underlie the process. Starch ordinarily shows two maxima and two minima each year, with sometimes three maxima in bearing trees. Moisture and starch contents were apparently inversely related. Determinations on flowers and fruit showed a drain on starch in the branches back of the spur, especially as fruit maturity was approached. Loss of nitrogen from spurs and from adjoining wood and bark was not found sufficient to account for the nitrogen present in flowers and fruit. Leaves are not apparently active competitors for nitrogen after they have attained full size.

Citrus production in the lower Rio Grande Valley of Texas, H. P. Traub and W. H. Friend (*Texas Sta. Bul. 419 (1930), pp. 60, figs. 2*).—Commenting briefly on the present status of citrus production in the Rio Grande Valley, the results are presented of species and variety tests, of rootstock trials, and of various orchard management and fertilizer studies. In general grapefruit was found the most profitable citrus for the region, the Marsh and Thompson varieties being preferred. Among oranges the Hamlin is recommended as an early and the Valencia as a late variety. The Clementine or Algerian tangerine and the Meyer lemon were found best in their groups, and the kumquat was the hardiest citrus of all. The sour orange was found a valuable stock for the grapefruit, sweet orange, tangerine, and lime, Rusk Citrange for Satsuma oranges, Meyer lemon for the Meyer lemon, and rough lemon or Rusk Citrange for the kumquat.

The use of leguminous cover crops and a system of mulching gave better results in terms of yield than did modified clean culture or nonleguminous cover cropping. Analyzed statistically, fertilizers did not yield significant increases, but it is not considered unlikely that as the trees become older the needs for fertilizer may become evident. Grapefruit trees grew so rapidly that with spacings less than 25 by 25 ft. crowding was evident.

A note on the abnormalities in the composition of oranges, P. R. v. d. R. Copeman (*So. African Jour. Sci., 27 (1930), pp. 310–316, fig. 1*).—Rather striking differences were observed in the composition of oranges harvested at weekly intervals over a period of about 3 months from 6 neighboring trees in a single orchard. The fruit from 2 of the trees was abnormally low in soluble solids, sugars, and acids, suggesting the difficulty in obtaining uniform and accurate samples for analysis.

Filberts, G. L. Slate (*New York State Sta. Bul. 588 (1930), pp. 32, figs. 3*).—A general discussion of filbert growing, species, varieties, cultural requirements, pollination needs, etc. Observing marked similarity in many of the varieties under test, the author separates them into distinct groups designated as Barcelona, Bollwiller, Daviana, Kentish Cob, Aveline, and Early Globe. In pollination studies excellent sets were obtained on the Barcelona variety with several other varieties of pollen, except Barcelona and Rush. On the other hand, Rush was satisfactorily pollinated with Barcelona. Notes are presented on the resistance of the catkins of the various varieties to winter injury and on the time of blooming.

FORESTRY

Correlation alinement charts in forest research: A method of solving problems in curvilinear multiple correlation, D. Bruce and L. H. Reineke (*U. S. Dept. Agr., Tech. Bul. 210 (1931), pp. 88, figs. 33*).—Pointing out that purely graphic methods are inadequate for the solution of many forestry problems because of the opportunity for error and their inapplicability to cases involving more than three variables, the authors present a curvilinear-correlation method combining both graphic and statistical technic. This new method is claimed to permit the solution of many problems hitherto considered insoluble on account of the complexity or number of data required. The field of application includes all branches of forest research where qualitative measurements are made, wherever more than two variables are involved, and wherever curvilinear relations are suspected. The final result is in the form of an alinement chart.

Ohio Forest News, [February, 1931] (*Ohio Forest News [Ohio Sta.], No. 12 (1931), pp. 8, fig. 1*).—This pamphlet contains brief popular articles, one of which, by R. R. Paton, discusses the results of depths of planting experiments in the forest nursery at Wooster and leads to the suggestion that red pine and Norway spruce be covered with 0.5 to 0.75 in. of sand and Scotch and Austrian pine seeds with 0.375 to 0.5 in. of sand.

DISEASES OF PLANTS

[Plant pathology at the Oklahoma Station] (*Oklahoma Sta. Rpt. 1927–1930, pp. 283–292, 325*).—The decline in alfalfa in various sections of the State is attributed by F. M. Rolfs to no single disease but to the combined effects of 15 or 16 different organisms and to abnormal conditions, such as winter injury and drought. Two of the troubles, bacterial wilt and nematodes, are discussed in relation to their symptoms, methods of attack, control, etc.

Apple blotch (*Phyllosticta solitaria*), described as one of the limiting factors to apple production in Oklahoma, is discussed in relation to symptoms on the leaves, fruit, and shoots, with comments on the methods of control. Placing apples in cold storage at temperatures below 40° F. checked the growth of the blotch organism. Apples placed under straw in the orchard or stored in the farm cellar will continue to blotch. Bordeaux mixture was found to be the only efficient summer fruit spray, with lime sulfur, 1 gal. to 4 gal. of water, decidedly more efficient for renovating old infected trees during the dormant season.

At the Panhandle Station, according to H. H. Finnell, the wet formaldehyde treatment was found to be the only highly dependable control for covered smut of barley.

Stinking smut of wheat is there rarely, if ever, contracted by soil infection, and the use of smut-free seed has given immunity.

A bacterial disease of wheat [trans. title], J. Millasseau (*Rev. Path. Vég. et Ent. Agr., 15 (1928), No. 9, pp. 279–284, pl. 1, fig. 1*).—Near Paris, wheat shows a disease resembling black chaff in association with an organism supposedly related to or identical with *Bacterium translucens undulosum*.

Scab of Canavalia caused by Elsinoe canavaliae, A. E. Jenkins (*Jour. Agr. Research [U. S.], 42 (1931), No. 1, pp. 1–12, pls. 4*).—Herein is discussed the history, symptoms, morphology, classification, and pathogenicity of an obscure disease caused by *E. canavaliae* and known to attack *C. gladiata* and possibly *C. ensiformis*, although confusion in the distinction of the host species has caused uncertainty as regards specific susceptibility.

On the basis of material in the U. S. National Herbarium, the Malay Peninsula is added to the known habitat of the disease, which already included Ceylon, the Philippines, and Java.

Lima-bean scab caused by Elsinoe, A. E. JENKINS (*Jour. Agr. Research* [*U. S.*], *42* (*1931*), *No. 1, pp. 13–23, pls. 5*).—The symptoms, morphology, and cultural characteristics of a disease called scab, which seriously affects Lima beans in Cuba and Porto Rico, are discussed. The pathogene is tentatively identified as *E. canavaliae,* mentioned in the preceding paper. The leaves, stems, and fruits of the Lima bean plant are attacked, and in severe infection the development of the fruits may be inhibited. In none of the cases observed were the lesions found to penetrate to the seed. Despite the fact that diseased beans have undoubtedly entered the United States at various times, no evidence of outbreaks is recorded.

A seed-borne disease of clover (*Trifolium repens* L.), N. L. ALCOCK and M. S. MARTIN (*Bot. Soc. Edinb. Trans. and Proc., 30* (*1927–28*), *pt. 1, pp. 13–18, pl. 1*).—Clover seed received from central Europe and from New Zealand in 1927 and 1928 at the seed-testing station showed a mat of resting fungus mycelium under the seed coat. This organism when cultured went through its life history in agreement throughout with *Sclerotinia trifoliorum,* except that the apothecia were, as regards range, consistently smaller. One instance of reinfection and recovery is indicated.

The control of corn diseases in Illinois, B. KOEHLER and J. R. HOLBERT (*Illinois Sta. Circ. 364* (*1931*), *pp. 28, pl. 1, figs. 18*).—A general discussion of the various diseases attacking the corn plant and corn seed, with suggestions as to preventive measures and control treatments. Sanitation, crop rotation, soil management, development of disease-resistant strains, and seed treatment are among the measures discussed, and it is pointed out that all should be considered in a well rounded out program for corn improvement.

On the incidence of leaf curl of cotton in southern Nigeria, C. J. LEWIN (*Nigeria Agr. Dept. Ann. Bul., 6* (*1927*), *pp. 70–77, pl. 1*).—A brief account is given of the earlier occurrence, type and species incidence, and effects of cotton leaf curl in southern Nigeria. It is suggested that Ishan cotton (*Gossypium vitifolium*) is slightly more susceptible than Meko (*G. peruvianum*). Preliminarily it appears that the boll reduction in size is due to the lowering of the number of seeds. Fertilization may also be lowered. Though no crossing experiments have yet been started, resistance is thought to be hereditary, and two of the isolated strains of Ishan appear highly resistant.

Even highly resistant strains appear to become susceptible during the early rains. No case of absolute immunity has been found.

On the powdery mildew of flax, Y. HOMMA (*Bot. Mag.* [*Tokyo*], *42* (*1928*), *No. 499, pp. 331–334, figs. 2*).—Stating that two different species of powdery mildew are parasitic on cultivated flax in Japan, the author gives descriptive details of the organisms said to agree essentially with those of *Erysiphe polygoni* and *Oidium lini.*

Neck rot of onions, E. L. LECLERG (*Colo. Agr. Col. Ext. Bul. 301A* (*1929*), *pp. 16, figs. 10*).—Onion neck rot, though present in Colorado for some years, has caused serious loss only recently. This damage, occurring largely in storage or in transit, has been due to conditions which are briefly outlined.

The organism (*Botrytis allii*) can live on trash and organic matter in the soil, gaining entrance to the bulbs through injury due to hail, handling contacts, or harvesting cuts. The disease is described, with favoring conditions. These include principally, during growth, damp cool weather; during harvesting, unripeness in the tops; in storage, high temperatures, humidity, and poor

ventilation; and in transit, sprout and root development, imperfect curing, freezing, high percentage of doubles and splits, and damp sacks. Recommendations for control include, before storing, careful sorting, proper care as regards contacts, and adequate drying; and in storage, ventilation and cooling (36 to 34° F.).

A disease of parsley [trans. title], G. NICOLAS and AGGÉRY (*Rev. Path. Vég. et Ent. Agr., 15 (1928), No. 7, pp. 182, 183, figs. 5*).—A disease of parsley is described as associated with a Pythium, of form and dimension corresponding approximately to *P. megalacanthum*.

Factors influencing the effectiveness of organic mercury dusts in pea-seed treatment, L. K. JONES (*Jour. Agr. Research [U. S.], 42 (1931), No. 1, pp. 25–33, fig. 1*).—Noting that various environmental factors, such as temperature and moisture content of the soil at the time of planting and immediately afterwards, as well as the nature of the treating material, greatly influenced the results of disinfecting pea seed, a series of experiments was carried on with various dust disinfectants used under normal conditions and with modification of the soil moisture.

Organic mercury dusts containing at least 12 per cent of the mercury phenolate were the most effective in increasing stands. In fact, organic mercury dusts containing 6 per cent or less of chlorophenol mercury, nitrophenol mercury, or cresol mercury were of little value. Semesan dust was found consistently beneficial, even under the various modifications of soil moisture and soil temperature utilized.

Applications of water to the soil soon after planting greatly reduced the percentage germination of untreated pea seed, this reduction being greater with wrinkled-seeded than with smooth-seeded varieties. In the case of untreated Alaska seed a delay of 24 or 48 hours in applying the water greatly reduced this injurious effect on germination. The effects of soil moisture are believed to account in part for the wide variations reported in seed-treatment tests.

The potato blight disease [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 52 (1928), pp. 16*).—A brief outline is given regarding outbreaks, incidence, influencing conditions, and control of *Phytophthora infestans*.

A notification service regarding the appearance of potato late blight [trans. title], N. VAN POETEREN (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 53 (1928), pp. 8, figs. 2*).—The working during the years 1927 and 1928 is indicated of a notification service against potato late blight (*Phytophthora infestans*).

Sugar beet seed disinfection [trans. title], A. L. GUYOT and O. DE LANTY (*Rev. Path. Vég. et Ent. Agr., 15 (1928), Nos. 4–5, pp. 125–134, fig. 1; 6, pp. 160–172, pl. 1*).—The first of these accounts, by Guyot, deals chiefly with *Phoma betae* and its control in connection with the sugar beet. The second, by both authors, tabulates, with detailed results and discussion, disinfection treatments employing hot water, concentrated H_2SO_4, phenol, cresol (soap emulsion), formol, mercury (salts), and copper sulfate.

Sugar beet root rot control, H. C. YOUNG (*Ohio Sta. Bimo. Bul. 148 (1931), pp. 15–18*).—Stating that blackroot is probably the most serious disease of sugar beets in Ohio and that the exact parasite or parasites are undetermined, although the fungus (*Phoma betae*) is usually associated with the trouble, the author discusses the control methods. The development of resistant varieties has not been as successful as has been the development of improved cultural practices for control. Commercial experiments having indicated that the use of common salt had a beneficial effect on the stand and yields, a series of tests was conducted in Henry, Fulton, and Lucas Counties with fertiliser

and salt in various combinations. The results were not highly significant. Salt was not harmful in any instance and in one test was distinctly beneficial, but it is pointed out that the drought modified the results. In concluding the author recommends a cultural practice involving rotation, early planting, and the use of salt and of fertilizer.

A key for the field identification of sugar cane diseases, A. F. BELL (*Queensland Bur. Sugar Expt. Stas., Div. Path. Bul. 2 (1929), pp. 119, pls. 28*).—This booklet includes an account of the structure of the sugarcane plant, a key to its diseases, instructions as to the use of the key, and descriptions of the symptoms and effects of more than 40 sugarcane diseases, disorders, and injuries, with a bibliography of 60 titles.

Fungus and bacterial diseases of vegetables, J. E. HOWITT, D. R. SANDS, and D. H. JONES (*Ontario Dept. Agr. Bul. 345 (1929), pp. 64, figs. 55*).—This bulletin, intended chiefly to enable vegetable growers to identify the more common fungus and bacterial diseases of vegetables and to apply intelligently approved treatments, describes the diseases briefly and summarizes appropriate fungicides and soil sterilization measures.

The more important fruit tree diseases of Ontario, J. E. HOWITT and L. CAESAR (*Ontario Dept. Agr. Bul. 344 (1929), pp. 45, figs. 32*).—This bulletin furnishes information looking to the identification of the more common diseases of fruit trees and the proper making and application of the treatments which experiments and observations during 18 years have shown to be effective.

Fire blight and its eradication, D. H. JONES (*Ontario Dept. Agr. Bul. 342 (1929), pp. 22, figs. 27*).—It is stated that wherever the policy formerly advocated (E. S. R., 23, p. 49) of carefully and radically cutting away diseased parts of the trees and burning the cuttings at once has been carried out, the bacterial blight has been controlled, though the expense and the overwintering of the fungus in overlooked infections are admitted to have been drawbacks. A survey during 1928 showed the smallest infection in 20 years.

Preliminary report on a variety of red currant resistant to Weymouth pine rust, G. G. HAHN (*Bot. Soc. Edinb. Trans. and Proc., 30 (1928–29), pt. 2, pp. 137–146, pls. 2*).—The author gives information regarding *Ribes* spp. and their history, relations, and behavior in Europe, Great Britain, and America, with an account of the resistance to white pine blister rust of the Norwegian Red Dutch variety of currant. It is thought that if this variety, "which has just been tested with such satisfactory results in Scotland under the rigorously controlled conditions imposed by the writer, maintains this character of immunity to white pine blister rust when introduced into America under environmental and fungus conditions there, it may prove to be a most valuable plant for propagation and utilization in the blister rust control program of the United States. This European variety gives promise of being a very useful plant for hybridization purposes in evolving other disease immune varieties."

The causal parasite of the lily disease, J. WRIGHT (*Bot. Soc. Edinb. Trans. and Proc., 30 (1927–28), pt. 1, pp. 59–65, figs. 2*).—An outbreak of a lily blight is recorded, the symptoms and associated organism of which are claimed to agree with those in a detailed descriptive account given in 1889 by M. Ward. The fungus is said to be distinct from the species causing a disease of lilies in Bermuda and from that parasitic on lilies in Japan. It is described as a new species, *Botrytis elliptica*. Control measures outlined include a sheltered southern exposure for the lily bed, destruction of all infected plants, and spraying with Bordeaux mixture (which may, however, at 5–5–50 strength cause injury to leaves and flowers) or 2 per cent calcium bisulfite.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Conserving Canada's musk-oxen, W. H. B. Hoare (*Ottawa: Dept. Int., N. W. Ter. and Yukon Branch, 1930, pp. 53, figs. 26*).—An account of an investigation of the Thelon Game Sanctuary east of Great Slave Lake, Northwest Territories, in the year 1928–29, with a brief history of the area, a description of the woods in the sanctuary, an estimate of the present distribution and numbers of musk oxen in Canada, and notes on the caribou. Accounts of the musk ox compiled by the author (pp. 41–48), and of the musk ox and caribou by R. M. Anderson (pp. 49–53), are presented as appendixes.

A contribution to the knowledge of the ecology, biology, and distribution of Martes zibellina L. [trans. title], I. Kozhantschikov (*Ztschr. Wiss. Biol., Abt. A, Ztschr. Morph. u. Ökol. Tiere, 19 (1930), No. 2–3, pp. 291–320, figs. 2*).—This is a contribution based upon studies of the marten *M. zibellina* by the author, of Leningrad, from 1920 to 1924.

The grey squirrel in the British Isles, A. D. Middleton (*Jour. Min. Agr.* [*Gt. Brit.*], *37 (1931), No. 11, pp. 1069–1078, pls. 3, fig. 1*).—A more complete account of studies of the spread of the gray squirrel in the British Isles than that previously noted (E. S. R., 64, p. 453).

Birds of Arkansas, W. J. Baerg (*Arkansas Sta. Bul. 258 (1931), pp. 197, figs. 38*).—The introductory part of this work (pp. 3–24) consists of discussions of the sources of information; economic value of birds; longevity of birds; birds in relation to haunts or nesting sites; nests and eggs; incubation; migration, including a tabulated list of migration records at Fayetteville from 1924 to 1928; classes of migrants; migration calendar; song and call notes, including a tabulated list of the song period of birds, 1924 to 1928; the average song period; mimics; how to attract birds; pests among birds; and how to study birds. The main part of the work (pp. 24–182) consists of a list of 312 forms, of which 297 have been reported from the State and 15 are included on good circumstantial evidence. For each species a list is given of the common name, a brief technical description, the range, and, with some, notes on their habits. An index to the bulletin is included.

Mynah birds and starlings as potential pests in California, H. J. Ryan (*Calif. Dept. Agr. Mo. Bul., 19 (1930), No. 11, pp. 740–746, figs. 3*).—The recent finding in California of individuals of the common myna bird or house myna (*Acridotheres tristis* L.), a native of India which has extended its range into many other countries, including the Hawaiian Islands, indicates that it may have secured a foothold in the United States.

The blue goose, J. D. Soper (*Ottawa: Dept. Int., N. W. Ter. and Yukon Branch, 1930, pp. 64, pls. 2, figs. 18*).—An account of the breeding ground, migration, eggs, nests, and general habits of the blue goose (*Chen caerulescens* (L.)) on Baffin Island. It is pointed out that the breeding ground of the blue goose on this island occupies a portion of a vast swamp plain, or tundra region, approximately 5,500 square miles in area. This ground is utterly valueless except from the standpoint of the conservationist as a great breeding ground for geese, as well as other species of Arctic birds. The nests and eggs of the blue goose were first discovered on June 26, 1929, and with this an outstanding hiatus in American ornithology was definitely filled.

A list of 35 references to the literature is included.

A dweller in the piney woods [Bufo quercicus], F. Harper (*Sci. Mo., 32 (1931), No. 2, pp. 176–181, figs. 4*).—An account of observations of the habits of the oak toad (*B. quercicus*), the smallest species of the genus in North America, which ranges from North Carolina to Florida, Alabama, and Louisiana, and seems to be restricted to the Coastal Plain.

Studies on Leptospira icterohemorrhagiae, J. R. RIDLON (*Pub. Health Rpts.* [*U. S.*], *46* (*1931*), *No. 1*, *pp. 1–5*).—In monthly examinations made of large numbers of wild rats at the Federal laboratory at San Francisco, Calif., *L. icterohaemorrhagiae* was, by dark field examination, found in the kidneys of about one-third of those examined.

Some notes on liver-fluke investigations, J. N. SHAW (*Jour. Amer. Vet. Med. Assoc.*, *78* (*1931*), *No. 1*, *pp. 19–24*).—This general account deals with the life history of the liver fluke (*Fasciola hepatica*), snail hosts, rediae and cercariae, symptoms and lesions, treatment, control, and cost of pasture treatment.

Rotenone, I–V (*Jour. Amer. Chem. Soc.*, *51* (*1929*), *No. 8*, *pp. 2574–2581*; *52* (*1930*), *Nos. 3*, *pp. 1088–1098*, *1102–1104*; *6*, *pp. 2480–2483*).—The contributions here presented from the insecticide division of the U. S. D. A. Bureau of Chemistry and Soils are as follows: (1) Reduction Products of Rotenone (pp. 2574–2581), (2) The Derivatives of Derritol (pp. 1088–1091), and (3) Dehydrotenone (pp. 1091–1098), all by F. B. LaForge and L. E. Smith, (4) Constitution of Rotenone, by F. B. LaForge (pp. 1102–1104), and (5) The Identity of Isotubaic and Rotenic Acids, by H. L. Haller and F. B. LaForge (pp. 2480–2483).

***The solubility of rotenone,* I,** H. A. JONES and C. M. SMITH (*Jour. Amer. Chem. Soc.*, *52* (*1930*), *No. 6*, *pp. 2554–2562*, *fig. 1*).—This contribution from the insecticide division of the U. S. D. A. Bureau of Chemistry and Soils deals with the solubility and optical rotation of rotenone in certain organic solvents at 20° C.

Studies in certain factors affecting the resistance of plants to insect pests, E. P. MUMFORD (*Science*, *73* (*1931*), *No. 1880*, *pp. 49*, *50*).—In this brief discussion the author presents examples of epiphylaxis, the term proposed for external protective agencies, and of endophylaxis, the term for the internal protection afforded by biochemical qualities that render the plant unattractive or repellent or unsuited to the food requirements of insects. A list is given of 15 references to the literature.

Notes on the culturing of insects for virus work, M. A. HAMILTON (*Ann. Appl. Biol.*, *17* (*1930*), *No. 3*, *pp. 487–492*, *pl. 1*, *figs. 3*).—In this contribution from the Rothamsted Experimental Station, the author describes a method for keeping pure and uninfected cultures of aphids for virus work, which involves the use of cellophane and bolting silk on a metal framework. Specially constructed glass capsules in which aphids can be fed on artificial media, plant extracts, or dyes are described.

Index IV to the literature of American economic entomology, January 1, 1925, to December 31, 1929, compiled by M. COLCORD, edited by E. P. FELT (*Melrose Highlands, Mass.: Amer. Assoc. Econ. Ent.*, *1930*, *pp.* [*9*]+*518*).—This continuation of the index to the literature of American economic entomology (E. S. R., 54, p. 151) covers the five-year period ended December 31, 1929.

Montana insect pests for 1929 and 1930, R. A. COOLEY (*Montana Sta. Bul. 238* (*1930*), *pp. 23*, *figs. 2*).—This twenty-third report of the State entomologist of Montana (E. S. R., 61, p. 153) deals with the occurrence of and work with several of the more important insects of the year in Montana in addition to a general account of the entomological service in the State, a report of correspondence on insect pests, etc.

[Report of work in economic entomology and zoology at the Oklahoma Station] (*Oklahoma Sta. Rpt. 1927–1930*, *pp. 232–274*, *figs. 5*).—This report consists of articles by several authors.

It is pointed out by C. E. Sanborn that poisoning is effective in the control of rodents. F. E. Whitehead emphasizes the fact that experiments have shown that birds are not seriously injured by feeding upon poison bran mash used in combating the grasshopper or by eating the insects that have fed upon it. No injury to quail resulted when poison bran was scattered in a cage in which they were confined, applied at the rate of 100 lbs. per acre rather than the usual 10 to 15 lbs. Experiments with chickens gave similar results.

It is reported by Sanborn that tests made during the seasons of 1928 and 1929 of methods of boll weevil control indicate that a sweet bait mixture is the most profitable. A comparison of arsenical applications for the boll weevil, the results of which are reported in tabular form, shows the profit or loss per acre in comparisons of calcium arsenate dust, sweet baits, and sweet baits followed by calcium arsenate dust, made during the summers of 1928 and 1929. Mention is made of a splatter, catcher boll weevil machine invented at the station which, due to a lack of boll weevil infested fields, could not be given a thorough trial.

An account is given by G. A. Bieberdorf of the corn leaf aphid, which is hard to control.

In a discussion of the importance of the crow it is estimated that during the 120 days of an Oklahoma winter the 10,000,000 crows in the State consume $1,200,000 worth of feed, or $\frac{1}{100}$ bu. of grain per crow per day.

An account of anaplasmosis, particularly as related to its possible spread by ticks and flies, is given by Sanborn. A discussion of the transmission of anaplasmosis is given by Sanborn, G. W. Stiles, L. H. Moe, and H. W. Orr, reference being made to one successful experimental transmission of the infection by flies. Fly experiments in 1929 are reported upon by Stiles and Moe, and in 1930 by Sanborn and Stiles. They record the exposure of an 8-year-old healthy cow to a total of 41 bites by three species of flies, namely, *Tabanus gracilis*, *T. sulcifrons*, and *Chrysops sequax*, which animal developed a typical case of anaplasmosis at the end of 112 days and died from the disease 117 days after infestation. This cow was under screened, controlled conditions and is believed by the authors to have died as a result of contracting anaplasmosis from fly bites, the source of the virus having been a young, prenatally infected carrier bull which never showed clinical symptoms of the disease.

In an account of work with bees it is pointed out that profits are increased through proper care.

Cyanogas was found to be the most effective means of exterminating prairie ants of the species *Pogonomyrmex occidentalis*.

Notes are also given on the inspection of flour mills and on miscellaneous insect pests.

[Contributions on economic insects and their control] (*Wash. State Hort. Assoc. Proc., 25 (1929), pp. 57–69, figs. 8; pp. 69–88, 89–94, figs. 3; pp. 95–107, figs. 3; pp. 130–136, 143–148, 150–155, 212–215*).—The contributions here presented are as follows: Recent Development in Combination Sprays for Codling Moth Control, by A. Spuler and F. P. Dean (pp. 57–69); Lead Arsenate Oil Sprays and Residue Removal, by H. C. Diehl (pp. 69–88); Relation of Codling Moth Combination Sprays to Injury and Residue Removal, by F. L. Overley (pp. 89–94); Recent Developments in Controlling Codling Moth with Nicotine-Oil, by F. E. DeSellem (pp. 95–107); General Fruit Pest Conditions in the State and Their Economic Importance, by W. S. Regan (pp. 130–136); Lessons in This Year's Experience in Codling Moth Control, by A. Spuler (pp. 143, 144); My Experience with Codling Moth Control, 1928–1929, by R. L. Barry (pp. 145–148); Red Spider Control, by E. J. Newcomer (pp. 150–153); Tarnished Plant Bug, by A. L. Deaver (pp. 154, 155); and Observations on

the Pests and the Diseases Peculiar to Sour Cherries, by L. K. Jones (pp. 212–215).

The entomological branch, R. WEIR (*Canada Min. Agr. Rpt. 1929–30, pp. 128–150*).—This is a general account of the work of the year (E. S. R., 63, p. 253).

[Report of entomological work in Barbados] (*Barbados Dept. Agr. Rpts. 1926–27, pp. 14, 15; 1927–28, pp. 20, 21*).—*These annual reports deal briefly with insect attacks reported or observed during the years under report* (E. S. R., 54, p. 553).

Report of the entomologist, R. W. E. TUCKER (*Barbados Dept. Sci. and Agr. Rpt. 1928–29, pp. 79–84*).—This is the usual annual report (see above). The control of the sugarcane borer is being attempted through the mass rearing and liberation of the chalcid egg parasite *Trichogramma minutum* Riley.

[Contributions on economic insects of Brazil] (*Campo [Rio de Janeiro], 1 (1930), No. 9, pp. 12, 13, 17–20, 21–24, 26, 27, figs. 28*).—The contributions on insects of importance in Brazil here presented are as follows: A New Coccid Enemy [*Ferrisia virgata*] of Cotton in Northeastern Brazil, by A. da Costa Lima (pp. 12, 13); Insect Enemies of the Sweetpotato in Brazil, I, including descriptions of two new thrips, *Heliothrips ipomoeae* n. sp. and *Scirtothrips batatae* n. sp., by G. Bondar (pp. 17–20); a Popular Account of the Lepidoptera of the Federal District and Vicinity, by B. Raymundo (pp. 21–24); and the Manner of Combating Ants (pp. 26, 27).

Supplement to the second systematic catalogue of the insects which attack plants in Brazil, with a bibliography of Brazilian entomological literature [trans. title], A. DA COSTA LIMA (*Campo [Rio de Janeiro], 1 (1930), Nos. 7, pp. 38–48; 8, pp. 84–91; 9, pp. 28–31; 10, pp. 29–31; 11, pp. 66–69; 12, pp. 41–46*).—In this supplement to the annotated catalogue of the economic insects and literature of Brazil, previously noted (E. S. R., 59, p. 552), 485 forms and 251 titles (pp. 38–48) are listed. Indexes to the insects and host plants are included (pp. 41–46).

[Annual report of the division of entomology, 1929], N. C. E. MILLER (*Straits Settlements and Fed. Malay States Dept. Agr., Gen. Ser. No. 3 (1930), pp. 50–61*).—This annual report of the division of entomology of the Straits Settlements and Federated Malay States deals with some of the more important pests of the year, followed by notes on miscellaneous insects.

Annual report of the senior entomologist, 1929, T. J. ANDERSON (*Kenya Colony Dept. Agr. Ann. Rpt. 1929, pp. 433–463*).—Included in this report is an account of work by H. C. James and R. H. Le Pelley with the coffee mealybug *Pseudococcus lilacinus* Ckll., the most economically important species of mealybug at present found on coffee in Kenya, its natural enemies, etc. (pp. 436–452); an account of the inoculation of coffee bushes as a control of mealybug; and notes on *Asterolecanium coffeae* Newst. and coffee borers.

Cotton pests in Nigeria, F. D. GOLDING (*Trop. Agr. [Trinidad], 8 (1931), No. 2, pp. 28, 29*).—A brief summary of information on the more important pests of cotton in Nigeria, presented in connection with a list of 13 references to the literature.

Insects of the pecan and how to combat them, G. F. MOZNETTE, T. L. BISSELL, and H. S. ADAIR (*U. S. Dept. Agr., Farmers' Bul. 1654 (1931), pp. II+60, figs. 72*).—A revision which supersedes Farmers' Bulletin 1364, previously noted (E. S. R., 51, p. 253).

[Pecan insects] (*Ga.-Fla. Pecan Growers Assoc. Proc., 1930, pp. 24–32*).—Some Facts about the Pecan Weevil and Suggestions for Control, by T. L. Bissell (pp. 24–27), and a discussion of the Results of Experiments in 1929

in the Control of the Pecan Leaf Case-Bearer with Some Arsenicals When Combined with Bordeaux Mixture, by G. F. Moznette (pp. 28–32), were presented at the annual convention of the Georgia-Florida Pecan Growers Association.

Biological control of prickly-pear, F. D. Power et al. (*Queensland Prickly-Pear Land Comn. Ann. Rpt., 6 (1929–30), pp. 14–17, pls. 2*).—This account deals with the distribution of the pricklypear-destroying insects, particularly *Cactoblastis cactorum*, and the progress made with them. A map showing the number of *C. cactorum* liberated in each land agent's district is included.

A manual of the dragonflies of China: A monographic study of Chinese Odonata, J. G. Needham (*Peiping, China: Fan Mem. Inst. Biol., 1930, pp. [3]+344+11, pls. 20, figs. 2*).—Following an introduction, a historical account, a discussion of the describers of Chinese dragon flies, a summary by genera of the present knowledge, and abbreviations and explanatory notes, systematic descriptions are presented at length (pp. 15–285) of 266 nominal species belonging to 89 genera, of which 1 genus and 62 species are described as new. The account includes an annotated list of Chinese species (pp. 286–292) and a bibliography (pp. 293–304).

The California species of the genus Amitermes Silvestri (Isoptera), S. F. Light (*Calif. Univ. Pubs. Ent., 5 (1930), No. 9, pp. 173–214, pls. 6, figs. 31*).—Eight forms of termites of the genus Amitermes of Silvestri are recognized as occurring in California, of which four are described as new.

The desert locust in India, 1929–1930, B. C. Burt and G. R. Dutt (*Agr. Jour. India, 25 (1930), No. 5, pp. 417–425, pls. 2*).—This account includes a map of India showing the Provinces and districts invaded.

The rôle of Thrips tabaci Lindeman in the transmission of virus diseases of tomato, P. H. Jarrett (*Ann. Appl. Biol., 17 (1930), No. 3, pp. 444–451*).—In three experiments conducted at the Rothamsted Experimental Station, in which 350 adults and 50 nymphs of the onion thrips were tested, no virus transmission of tobacco mosaic and glasshouse streak took place.

An historical note on Tirathaba rufivena Walk. (the greater coconut spike moth) and its three parasites in Malaya, G. H. Corbett (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 3 (1930), pp. 1–9*).—In this account special attention is given to the parasites of the greater coconut spike moth (*T. rufivena*) in Malaya, particularly the tachinid *Erycia* (*Hemimaticera*) *basifulva* Bezzi., the braconid *Apanteles tirathabae* Wilkn., and the ichneumonid *Nemeritis palmaris* Wilkn.

The gipsy moth and the brown-tail moth, A. F. Burgess (*U. S. Dept. Agr., Farmers' Bul. 1623 (1930), pp. II+33, figs. 19*).—A revision which supersedes Farmers' Bulletin 1335, previously noted (E. S. R., 49, p. 852).

The corn earworm as an enemy of field corn in the Eastern States, W. J. Phillips and G. W. Barber (*U. S. Dept. Agr., Farmers' Bul. 1651 (1931), pp. II+18, figs. 17*).—A revision which supersedes Farmers' Bulletin 1310, previously noted (E. S. R., 48, p. 854).

The European corn borer, L. Caesar and R. W. Thompson (*Ontario Dept. Agr. Bul. 358 (1931), pp. 19, figs. 15*).—A practical account.

New methods for the control of codling moth, F. W. Pettey (*Union So. Africa Dept. Agr. Bul. 90 (1930), pp. 10, fig. 1*).—A report of experiments conducted in 1929 and 1930 in continuation of those previously noted (E. S. R., 61, p. 756).

International corn borer investigations: Scientific reports, III, edited by T. Ellinger (*Internatl. Livestock Expo. [Chicago], Internatl. Corn Borer Invest. Sci. Rpts., 3 (1930), pp. [11]+174, pl. 1, figs. 36*).—This third volume (E. S. R., 63, p. 849) reports on investigations of the European corn borer with the fol-

lowing contributions: Biological Researches on *Pyrausta nubilalis*, III, by E. Roubaud (pp. 1–27); New Bacteria Pathogenic to the Larvae of *Pyrausta nubilalis* Hb., by S. Metalnikov, J. Ermolaev, and V. Skobaltzyn (pp. 28–36); Note on the Bacteria Isolated from *Ephestia kuehniella* Zell., by T. Ellinger and V. Chorine (pp. 37, 38); Preliminary Note on Corn Borer Parasites Collected in 1929–1930 in the Union of Socialistic Soviet Republics, by T. Ellinger (pp. 39–41); Notes on *Pyrausta nubilalis* Hb. and Its Parasites in Bulgaria and Roumania, by H. Sachtleben (pp. 42–57); The Corn Borer Situation in Baden (Germany) in the Year 1928, by G. Kunike (pp. 58–63); On the Infection of *Pyrausta nubilalis* Hb. by *Metarrhizium anisopliae* (Metsch.) Sor., II, by H. Wallengren (pp. 64–73); On the Use of Chemicals in the Fight against *Pyrausta nubilalis*—A Preliminary Report, by L. Marchlewski (pp. 74–80); The Aspects of Chemical Warfare against the Corn Borer, by A. Kotlan and E. Varga (pp. 81–90); Field Experiments on the Application of *Bacillus thuringiensis* against the Corn Borer, by B. Husz (pp. 91–93); On the Use of Bacteria in the Fight against the Corn Borer, by V. Chorine (pp. 94–98); Report on a Corn Variety Test under Corn Borer Conditions, by T. Ellinger and V. Chorine (pp. 99, 100); On the Parasites of *Pyrausta nubilalis* Hb. in Hungary, by H. Sachtleben (pp. 101–112); The Fight against the Corn Borer in Yugoslavia (pp. 113–115) and A Corn Variety Test under Artificial Corn Borer Infestation (pp. 116–120), both by V. Vouk; The Corn Borer Situation in Southern Yugoslavia (pp. 121–129), On the Application of *Metarrhizium anisopliae* against *Pyrausta nubilalis* (pp. 130–141), and On the Mortality of *Pyrausta nubilalis* Hb. (pp. 142–147), all by B. Hergula; and Experiments on the Application of Bacteria against the Corn Borer, by S. Metalnikov, B. Hergula, and D. M. Strail (pp. 148–151).

These reports are followed by a report of the Second International Corn Borer Conference held at the Royal Hungarian Veterinary College, Budapest, June 2–4, 1930, with the following papers: Private Capital and the Promotion of Scientific Agricultural Research, by L. Marchlewski (pp. 162–168); Division of Labor and Collaboration in Plant Protection Work, by M. Schwartz (pp. 169–172); and The Fight against the Corn Borer and the Responsibility of the Farmer, by I. Nagy (pp. 173, 174).

Epiblema strenuana Walk., the host of certain parasites of the oriental fruit moth, Laspeyresia molesta Busck (Lepidoptera), H. W. ALLEN and E. LOTT (*Ent. Soc. Wash. Proc., 32 (1930), No. 7, pp. 135, 136*).—The authors report upon the discovery that the common and widely distributed lepidopterous borer, *E. strenuana*, the larvae of which live in the stems of ragweed, serves as a host for several of the more important parasites of the oriental fruit moth. The parasites thus reared from this lepidopteran are *Macrocentrus ancylivora* Roh., *M. delicatus* Cress., *Glypta rufiscutellaris* Cress., *Pristomerus ocellatus* Cush., and *Cremastus minor* Cush. The first three mentioned are the most important parasites of the larvae of the oriental fruit moth, and are also among the more abundant parasites of *E. strenuana*.

"In a total of 284 borers reared from the stems of Ambrosia collected near Moorestown, N. J., between August 13 and September 3 last, 10 per cent were parasitized by *M. ancylivora*, 23 per cent by *M. delicatus*, 18 per cent by *G. rufiscutellaris*, and 5 per cent by *P. ocellatus*. Only 17 per cent of the host adults emerged, the combined parasitism being 83 per cent. From several collections of the same brood of *E. strenuana* obtained from points in Pennsylvania, Ohio, and Indiana, no *M. ancylivora* was reared. However, numerous *G. rufiscutellaris* and *M. delicatus* were reared from the three States mentioned, and *P. ocellatus* from Pennsylvania and Ohio."

This lepidopterous host, which belongs to the same subfamily as the oriental fruit moth, is widely distributed in the eastern United States and westward to the Rocky Mountains, its larvae boring in the stems of the host plant as do the larvae of the first generations of the oriental fruit moth. It occurs in great abundance over thousands of acres of grain stubble, weedy crops, and field and roadside borders which are overgrown with ragweed in middle to late summer. It apparently serves as a very important reservoir for parasites of the oriental fruit moth at certain periods of the year when the larger proportion of the larvae of this host are embedded in fruit and hence not accessible to attack by its larval parasites.

Codling moth experiments, 1928–29, N. S. NOBLE (*Agr. Gaz. N. S. Wales, 41 (1930), No. 10, pp. 771–780*).—This is a summary of the results obtained at the Bathurst Experiment Farm.

The tobacco splitworm Phthorimaea operculella [trans. title], W. H. EDWARDS (*Dépt. Agr. Ile Maurice, Sér. Sci., Bul. 13 (1929), pp. 8, pl. 1*).—An account of this enemy of tobacco in Mauritius, officially known as the potato tuber worm.

The Norway maple Nepticula (Lepidoptera), E. P. FELT (*Ent. Soc. Wash. Proc., 32 (1930), No. 8, pp. 146–149*).—An account is given of the European insect *N. sericopeza* Zell., which first came to attention in America in 1928 through its causing the persistent dropping of large numbers of Norway maple leaves. Attempts to rear the adult from the leaf stem and also from sod under infested Norway maple indicate that the insect is probably unable to complete its transformation in the leaf stems, and that this habit is abnormal and occurs only when there are no seeds available for oviposition. Infested seeds from New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania were observed by the author. Seeds of other maples, especially the sugar maple and sycamore maple, were repeatedly examined without finding any evidence of infestation by this pest. The wintering of the insect in cocoons upon the trees indicates that a dormant oil application would practically eliminate the infestation. Applications in late May with a spray consisting of 0.5 pint of nicotine, 3 lbs. of soap, and 2 qt. of molasses to 40 gal. of water gave a very promising degree of control. It killed adults and very probably prevented the issuance of moths from the cocoons.

The control of moths in upholstered furniture, E. A. BACK and R. T. COTTON (*U. S. Dept. Agr., Farmers' Bul. 1655 (1931), pp. II+33, figs. 35*).—This publication, which is intended to acquaint the reader with essential facts favoring the development and control of moths as pests of upholstered furniture, calls attention to the nature of the injury and to the fact that two kinds of moths are responsible for it. A brief summary is given of the biology and food of the clothes moths and accounts are given of the manner in which moths enter into furniture and of the two methods of attack upon woolen covers, namely, surface feeding and feeding from below the cover. Means of control are dealt with under the headings of preventive and remedial measures.

A major pest of Derris, Neolepta biplagiata, N. C. E. MILLER (*Malayan Agr. Jour., 18 (1930), No. 11, pp. 541–544, figs. 3*).—It is pointed out that while the tuber of Derris is attacked by several species of insects, especially moths, the larvae of which are responsible for an appreciable amount of damage to this important crop in Malaya, a small chrysomelid beetle which has been provisionally identified as *N. biplagiata* Jacoby is the most destructive.

Experimental studies of dengue, J. S. SIMMONS, J. H. ST. JOHN, and F. H. K. REYNOLDS (*Philippine Jour. Sci., 44 (1931), No. 1–2, pp. 1–251, pls. 3, figs. 67*).—After an introduction, these studies are reported under the following headings: Epidemiology of dengue in the Philippine Islands (pp. 4–18), transmission of

dengue by *Aedes aegypti* (pp. 19–25), transmission of dengue by *A. albopictus* Skuse (pp. 26–40), dengue transmission experiments with *Culex quinquefasciatus* (pp. 41–46), mechanical transmission of dengue virus through interrupted feeding by *C. quinquefasciatus* and *A. aegypti* (pp. 47–52), observations to determine whether or not dengue virus can penetrate normal human skin (pp. 53–56), observations on the possibility of hereditary transmission of dengue from infected female *A. aegypti* through the egg to the offspring (pp. 57, 58), experimental attempts to transmit dengue virus directly to larvae of normal *A. aegypti* (pp. 59–62), observations on the possibility of transmitting dengue virus from infected to normal *A. aegypti* through contaminated food or water (pp. 63–66), transmission of dengue virus by feeding normal *A. aegypti* on suspensions of infected mosquitoes (pp. 67–77), attempts to demonstrate the virus of dengue by microscopic examination (pp. 78–82), cultivation experiments with the virus of dengue (pp. 83–94), the viability of dengue virus (pp. 95–99), filtrability of dengue virus obtained from infected mosquitoes (pp. 100–111), experimental dengue in man (pp. 112–127), etc.

A revision of the North American tachinid flies of the genus Achaetoneura, R. T. Webber (*U. S. Natl. Mus. Proc., 78 (1930), Art. 10, pp. 37, figs. 14*).—Nineteen forms of the tachinid genus Achaetoneura based in part upon numerous reared specimens are recognized, of which 10 are described as new. A list of the hosts of 16 of the species is presented (p. 4).

Experiments in the control of the olive fruit fly by means of attractants [trans. title], V. Conte (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 3 (1929), pp. 308–320; abs. in Rev. Appl. Ent., 18 (1930), Ser. A, No. 7, pp. 367, 368*).—In experiments conducted with the olive fruit fly at Portici the liquid obtained from the olive after the oil had been separated, representing one-half the weight of the original olive, was the most effective attractant. This liquid, when used fresh and undiluted, is even more attractive than molasses to the olive fruit fly, and also attracts the Mediterranean fruit fly.

The leaf-miners of Aquilegia, with a description of a new species, S. W. Frost (*Ann. Ent. Soc. Amer., 23 (1930), No. 3, pp. 457–460, figs. 6*).—A study of the extensively mined cultivated columbine (*A. vulgaris*) and the wild species (*A. canadensis*) of North America has shown three species of leaf miners to be implicated, brief accounts of which are presented. It is pointed out that the columbine leaf miner (*Phytomyza aquilegiae* Hardy) and *P. minuscula* Gour. are well known miners of columbine. While the former apparently does occur in North America, the latter is abundant throughout the Continent and produces the characteristic tortuous linear mines present wherever Aquilegia grows. Under the name *P. aquilegiana*, the author describes a new species which closely resembles the European *P. aquilegiae*, but which makes blotch mines of a different type. This new species has been reared as a leaf miner on *A. vulgaris* from Arendtsville, Pa., and Ithaca, N. Y.

Studies on Oscinella frit Linn., N. Cunliffe (*Ann. Appl. Biol., 17 (1930), No. 3, pp. 549–553*).—The author presents comparative records of oat grain infestation by *O. frit* in Sweden during the year 1927, together with a note on sterility or "blindness" of grain (E. S. R., 61, p. 554).

Facts pertaining to the Japanese beetle, E. G. Rex (*N. J. Dept. Agr. Circ. 180 (1930), pp. 31, figs. 10; rev. ed. (1931), pp. 31, figs. 10*).—A summary of information on the life history and habits of the Japanese beetle, artificial control, plant quarantine regulations, etc.

A new species of Chrysobothris infesting strawberry plants (Coleoptera: Buprestidae), W. S. Fisher (*Ent. Soc. Wash. Proc., 32 (1930), No. 8, pp. 149–152*).—Under the name *C. fragariae* the author describes a new buprestid

which has been found boring into the crown of strawberry plants in Washington State and to occur also in Idaho.

The raspberry and loganberry beetle and its control.—Further experiments with pyrethrum emulsion sprays and a dust, C. L. Walton (*Jour. Pomol. and Hort. Sci., 8 (1930), No. 4, pp. 309–315, fig. 1*).—A report of further experiments with pyrethrum sprays, which gave excellent results, and a dust which was less effective.

The coffee berry borer (Stephanoderes hampei Ferr.).—A preliminary account, K. Kunhi Kannan (*Mysore Coffee Expt. Sta. Bul. 2 (1930), pp. [2]+12, pl. 1, figs. 2*).—The recent discovery of the coffee berry borer (*S. hampei*) and its distribution over a wide area in south India led to the preparation of this practical information, based largely on information obtained in Java publications.

Control of the white pine weevil on the Eli Whitney Forest, W. Maughan (*Yale Univ. School Forestry Bul. 29 (1930), pp. 37, pls. 8, fig. 1*).—A report of control work in the Eli Whitney Forest in Connecticut of the white pine weevil, studies of which by several authors have been noted (E. S. R., 63, p. 358).

The studies have shown that "the removal of weeviled tips in an infested stand reduces the subsequent amount of infestation. The number per acre of acceptable stems in treated stands is greater than in partially treated stands as a result of control work. Enough acceptable stems per acre to furnish a well-stocked stand in the final crop can be obtained on good and medium sites as a result of control work, . . . [but not] on poor sites even though weevil control is practiced. The final stands on the better sites contain more nonweeviled and slightly weeviled stems and less seriously weeviled stems than the stands on poorer sites. This indicates that permanent injury is more prevalent on the poor sites and recovery from attack is much better on the good sites. Weeviling subsequent to the time the stand closes is less injurious to the form of the tree than weeviling prior to the time the stand closes. Therefore, a large number of acceptable upper logs will be produced without special measures to secure them."

Pea-weevil control in the Willamette Valley, A. O. Larson (*Oregon Sta. Circ. 99 (1931), pp. 12, figs. 2*).—This is a preliminary account of the first season's studies conducted cooperatively by the station and the U. S. D. A. Bureau of Entomology in sections of the Willamette Valley of Oregon, where the Austrian winter field pea has become a very important crop.

The crop is heavily infested by the pea weevil, of which there is only one generation each year. The weevil, for which there are three principal sources of infestation, has greatly increased in abundance. The amount of infestation was less in isolated fields growing the first crop of peas than it was in fields having previously grown one or more crops of peas or in those fields adjacent to other fields. An examination of the peas shattered in the field in 22 different plats showed infestations varying from 0.25 to 91 per cent. The average of these infestations was 19 per cent. An examination of different kinds of peas grown in 57 experimental plats at the station showed that the pea weevil infestation ranged from 27 to 96 per cent, with an average of 71 per cent. The important sources of infestation are (1) garden peas that are allowed to ripen in large or small plats, most of which are not harvested and fumigated or destroyed before the pea weevils have emerged, (2) peas and pea screenings in public and private warehouses, and (3) the peas that are shattered out and left on the field at harvest, including those left in the straw stacks by stationary threshing machines.

For control measures it is recommended that peas be harvested early with combines or with pick-up machines with as little waste as possible, and that the whole crop be fumigated immediately after threshing and before it is cleaned. It is further recommended that the straw on the stubble be burned to destroy the weevils left in the peas on the field, and that all garden peas be harvested early and fumigated or destroyed to prevent weevil escape. The cooperation of all pea growers in carrying out the recommendations is considered essential for effective control.

Studies of the North American weevils belonging to the superfamily Platystomoidea, W. D. PIERCE (*U. S. Natl. Mus. Proc., 77 (1930), Art. 17, pp. 34, pls. 5*).—This treatment of weevils formerly classed under the family Anthribidae includes the erection of 7 new tribes, 2 new subfamilies, and a genus, and descriptions of 13 new species.

Beekeeping in Alaska, H. W. ALBERTS (*Gleanings Bee Cult., 58 (1930), No. 12, pp. 759, 760, fig. 1*).—This is a contribution from the Alaska Experiment Station which deals with the methods of wintering bees and the succession of honey plants during summer, and contains a note on the bees established at the station.

Twenty-ninth annual report of the Illinois State Beekeepers' Association, compiled by V. G. MILUM (*Ill. State Beekeepers' Assoc. Ann. Rpt., 29 (1929), pp. 196, figs. 18*).—Included in the proceedings of the annual meeting of the association are papers on The Correlation between the Worker Bee and the Worker Cell, by U. G. Stanley (pp. 44–47), The Relation of Insect Population to the Presence of a Pollination Problem, by R. Hutson (pp. 48, 49), How Much Do Honey-Bees Drift? by G. E. King (pp. 64–67), and Brood Rearing Temperature and Variations in Developmental Periods of the Honey Bee, by V. G. Milum (pp. 72–95), etc.

Report of the Dominion apiarist for the year 1929, C. B. GOODERHAM (*Canada Expt. Farms, Bee Div. Rpt. 1929, pp. 28, figs. 8*).—This is a report of work conducted in 1929 by the Canadian apiarist in the Ottawa apiary and the out-apiary at Britannia (E. S. R., 62, p. 456). The report deals with work in the study of bees as pollinators, queen breeding, the two queen system, Carniolan v. Italian bees, package bees as an aid to weak colonies, comparison of different sized hives, strength of field force, top entrance hives, middle entrance hives, winter cases with upper entrances, brood count, evaporation of nectar, disease, wintering, honey inspection, grades and regulations governing honey for sale on domestic market, etc.

[Apiculture] (*Canada Expt. Farms, Rpts. Supts. 1929, Agassiz (B. C.) Farm, pp. 55–59, fig. 1; Charlottetown (P. E. I.) Sta., pp. 54–56; Nappan (N. S.) Farm, pp. 67, 68*).—Reports are presented on the work with beekeeping in 1929 (E. S. R., 63, p. 554) at Agassiz, by W. H. Hicks (pp. 55–59); at Charlottetown, by J. A. Clark (pp. 54–56); and at Nappan, by W. W. Baird (pp. 67, 68).

Apiculture in Costa Rica [trans. title], J. M. ARIAS R. (*Cent. Nac. Agr. [Costa Rica] Bol. 10 (1930), pp. 40, figs. 5*).—This is a practical account of beekeeping under Costa Rican conditions.

Temperature gradient in the egg-laying activities of the queen bee, W. E. DUNHAM (*Ohio Jour. Sci., 30 (1930), No. 6, pp. 403–410, figs. 2*).—A report of a study conducted through application of the thermocouple method of recording temperatures. It was found that the egg-laying activity of the queen was carried on from 73 to 94° F., thus showing conclusively that after the queen has once started her egg-laying activities in the spring she is not absolutely confined in her egg-laying processes to a rather narrow range of temperatures.

The longevity of Bacillus amylovorus (Burr.) Trev. in association with honey, H. E. THOMAS (*Science, 72 (1930), No. 1877, p. 634*).—Experiments conducted by the author in California show that the fire blight organisms can be carried from blossoms into the hive and thence to other susceptible plants in the neighborhood. They may be transferred from one locality to another when the bees are moved for the purpose of effecting pollination in orchards, which is a rather common practice in some districts. It is considered possible, although it seems improbable, that the bacteria may occasionally survive in the beehive from the time of the scattered late blossoms in autumn until the first blossoms which appear in the spring.

Notes on the habits of a digger wasp and its inquiline flies, E. J. NEWCOMER (*Ann. Ent. Soc. Amer., 23 (1930), No. 3, pp. 552–563, figs. 8*).—An account of observations on the behavior of the sphecid *Podalonia luctuosa* (Smith).

The bionomics of Dibrachoides dynastes (Foerster), a parasite of the alfalfa weevil, H. D. SMITH (*Ann. Ent. Soc. Amer., 23 (1930), No. 3, pp. 577–593, figs. 7*).—This is an account of the most important prepupal and pupal parasite of the alfalfa weevil, which was introduced into the United States and artificially colonized in Utah in 1911.

A biological study of the ichneumonid Aphidius avenae Hal., parasite of aphids [trans. title], M. QUILIS PÉREZ (*Eos [Madrid], 5 (1929), No. 4, pp. 427–439, figs. 5*).—A report of a study of the biology of this parasite.

A new scelionid egg parasite of the black widow spider, H. L. DOZIER (*Ent. Soc. Wash. Proc., 33 (1931), No. 1, pp. 27, 28*).—Under the name *Baeus latrodecti* n. sp. the author describes a parasite reared from the egg mass of the poisonous black widow spider (*Latrodectus mactans*) in Haiti.

Preliminary observations on Sogata spp. pests of padi, N. C. E. MILLER and H. T. PAGDEN (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 3 (1930), pp. 10–14*).—Notes are given on what appear to be two species of Sogata, *S. pallescens* and *S. distincta*, which were a source of injury to paddy in the Province of Wellesley and in the Krian District of the Federated Malay States in the latter part of 1929.

Experimental transmission of an eruptive fever by Rhipicephalus sanguineus [trans. title], P. DURAND and E. CONSEIL (*Compt. Rend. Acad. Sci. [Paris], 190 (1930), No 21, pp. 1244–1246*).—The authors report experiments which demonstrate that the brown dog tick transmits Marseille fever.

Transmission of Marseille exanthematous fever by the brown dog tick (Rhipicephalus sanguineus) [trans. title], E. BRUMPT (*Compt. Rend. Acad. Sci. [Paris], 191 (1930), No. 19, pp. 889–891*).—The epidemic of a disease that broke out in Marseille, resembling but distinct from benign exanthematic typhus, for which it has been mistaken, has been found by the author to be the fièvre boutonneuse that occurs in countries bordering the Mediterranean, particularly in Tunis. The disease was transmitted to man by the subcutaneous inoculation of material from adult ticks (*R. sanguineus*) that were collected in the nymphal stage from dogs at the pound in Marseille. The infection may be carried through the winter in unfed adults and in nymphs that molted in late September and early October. The reservoir for the infection remains to be determined.

A report by Durand and Conseil on the transmission of the disease by this tick is noted above.

The tarsonemid mite of strawberry, A. M. MASSEE (*Jour. Pomol. and Hort. Sci., 8 (1930), No. 4, pp. 305–308, pl. 1*).—In the preliminary experiment conducted healthy strawberry plants of the Royal Sovereign variety became diseased and malformed when attacked by the strawberry mite (*Tarsonemus fragariae* Zimm.). The leaves attacked become crinkled and very brittle; the newly developing leaves turn a silvery brown color and in some instances dry up.

The tropical rat mite, Liponyssus bacoti Hirst., 1914, B. Shelmire and W. E. Dove (*Jour. Amer. Med. Assoc., 96 (1931), No. 8, pp. 579–584, figs. 5*).—The blood-sucking rat mite (*L. bacoti*) is described as a cause of skin eruption of man and a possible vector of endemic typhus fever, approximately 200 cases of "rate-bite dermatitis" being reported from Dallas, Tex., and neighboring towns.

ANIMAL PRODUCTION

Digestibility by sheep of the constituents of the nitrogen-free extract of feeds, G. S. Fraps (*Texas Sta. Bul. 418 (1930), pp. 15*).—The percentages of sugars, starches, pentosans, and residual nitrogen-free extract in a number of feeds and the digestibility by sheep of these nutrients in 56 feeds are given. Materials for this study were taken from digestion experiments previously noted (E. S. R., 47, p. 472; 51, p. 467; 62, p. 252).

This study shows that feeds known to have a high feeding value are high in starch, in sugar and starch combined, or in protein, while the nitrogen-free extract of feeds with a low feeding value is high in pentosans and in residual nitrogen-free extract. The nitrogen-free extract of some feeds contains considerable quantities of compounds which are not carbohydrates.

The sugars and starches were found to be highly digestible, while the digestibility of the pentosans varied according to the feed, being about from 50 to 60 per cent for a number of feeds. The pentosans of the crude fiber were usually less digestible than the total pentosans or those in the nitrogen-free extract. As a rule, the residual nitrogen-free extracts of hays and fodders were more digestible than were the pentosans.

The feeding value of the grain sorghums, hegari and yellow milo, compared with yellow corn, M. C. Smith (*Arizona Sta. Timely Hints for Farmers, No. 161 (1930), pp. 9, figs. 7*).—The results of this study have been previously noted (E. S. R., 63, pp. 555, 556).

Commercial feeding stuffs, September 1, 1929, to August 31, 1930, F. D. Fuller and S. D. Pearce (*Texas Sta. Bul. 420 (1930), pp. 186*).—The twenty-fifth annual report dealing with the chemical analysis and microscopical examination of 2,670 samples of feeding stuffs collected for official inspection during the year ended August 31, 1930 (E. S. R., 63, p. 57).

Some effects of varying calcium and phosphorus intake on the estrus cycle and reproduction in the rat, H. R. Guilbert and G. H. Hart (*Hilgardia [California Sta.], 5 (1930), No. 5, pp. 101–118, figs. 6*).—The purpose of this study was to obtain information on the relative influences of some nutritional factors on the oestrous cycle and reproduction in the rat that could be used in interpreting the results secured in the analyses of range grasses and the observations made on range cattle (E. S. R., 61, p. 362). Five different experiments were conducted, and in all but one rats were fed from weaning time to sexual maturity on a normal diet and were then placed on experimental diets. The stage of the oestrous cycle was determined by microscopic examination of the vaginal smear and recorded daily. At the end of each experiment the rats were killed and post-mortem examinations made. The purposes of the respective experiments were to study the influence of a low-phosphorus and a low-calcium diet on the regularity of the oestrous cycle, the effect of varying calcium and phosphorus intakes on fertility of males, to check experiment 1 and to study the influence of the calcium-phosphorus ration on the oestrous cycle, and the influence on growth and sexual maturity in females placed on a low-phosphorus diet at weaning time.

A diet with a calcium-phosphorus ratio of 4:1, and containing 0.22 per cent of phosphorus, seriously interfered with the growth and sexual maturity of the females in experiment 5. When a diet having the same calcium-phosphorus ratio and containing from 0.18 to 0.22 per cent of phosphorus was fed to rats from sexual maturity to about 100 days of age, ovulation became irregular or ceased entirely, but after 110 days of age such a ration appeared to maintain the normal oestrous cycle. Ovulation ceased in practically mature rats when the calcium-phosphorus ratio of their diet was widened to 8:1 at a 0.22 per cent phosphorus level. There were indications of relationship between low-phosphorus content of the blood serum and irregular ovulation.

Lowering the calcium content of a diet adequate in other respects from 0.82 to 0.22 per cent did not affect growth, oestrum, gestation, or lactation during two successive lactation periods. Marked abnormalities of the kidneys were associated with diets in which the phosphorus content was low and the calcium-phosphorus ratio 4 or more to 1, and this was especially true when the ratio was 8:1.

The age and diet relationship shown in this study with rats appears to have a parallel in range cattle. Yearling heifers which have had a good start in life usually breed, but in certain areas fail to conceive the following year. Evidence points to the fact that the phosphorus content of the blood serum of such heifers may be only 50 per cent that of similar animals raised under optimum conditions and that these heifers remain lower in blood phosphorus than mature cows for a time after new feed is available, whereas under optimum conditions heifers have a higher blood phosphorus content than cows.

Effects of sex, length of feeding period, and a ration of ear-corn silage on the quality of baby beef, S. BULL, F. C. OLSON, and J. H. LONGWELL (*Illinois Sta. Bul. 355, abs. (1930), pp. 19, figs. 12*).—This is an abstract of Bulletin 355 (E. S. R., 64, p. 164).

[Beef cattle experiments in Oklahoma] (*Oklahoma Sta. Rpt. 1927–1930, pp. 71–77, figs. 3*).—Two experiments are noted.

High-grade steers outclass scrubs, W. L. Blizzard and L. E. Hawkins.—Continuing this study (E. S. R., 60, p. 257), the results obtained in 1929 and 1930 checked to show that high-grade calves return a greater profit than scrub calves or calves by purebred bulls and out of scrub cows. The high-grade calves required less feed per unit of gain than the calves out of scrub cows by purebred bulls, while the scrub calves required 116 lbs. more grain and 85 lbs. more hay to produce 100 lbs. of gain than the high grades.

Limestone increases gains, W. L. Blizzard.—In this study covering three winter feeding periods, steer calves made the most economical gains on a ration of ground shelled corn, 1.5 lbs. of cottonseed meal, 2 per cent of ground limestone, and prairie hay. When 3.5 lbs. of cottonseed meal were fed, the rate of gain was decreased and the cost of gains was the highest of all lots. The use of 2.5 lbs. of cottonseed meal increased the rate and reduced the cost of gains as compared with a ration containing 3.5 lbs. of cottonseed meal and no limestone, but was not as economical as the 1.5 lbs. of cottonseed meal ration. A ration of shelled corn, 2 per cent of ground limestone, and prairie hay produced the poorest gains of the rations tested.

A study of nitrogen metabolism in sheep on high protein diets, J. STEWART (*Jour. Agr. Sci. [England], 20 (1930), No. 1, pp. 1–17, figs. 5*).—This is a preliminary report of a study at Cambridge University, England, in which the changes in the metabolism of sheep on excessive protein diets were recorded by nitrogen balances and weight curves. The source of the high-protein diet was linseed cake, and in this study it produced no weight increases during the first four months. On this basis it might be concluded that the proteins of

linseed cake have a very small biological value. However, previous experiments have shown that the metabolism of linseed cake is quite normal, and that it contains most of the essential amino acids in good proportions. The author believes that the results of this study show the need of a careful investigation into the physiology of protein metabolism during the high-protein feeding.

[Sheep experiments at the Matanuska Station], H. W. ALBERTS (*Alaska Stas. Rpt. 1929, p. 31, fig. 1*).—The Cotswold-Lincoln flock of sheep, fed from January 20 to March 25 on 2 lbs. of oat and vetch hay per head daily, ranged for from 3 to 5 hours daily to April 10, and receiving no supplementary feed after that date, sheared an average of 12.3 lbs. of wool per head.

The influence of a low and high calcium diet on the development and chemical composition of the skeleton in swine, R. E. EVANS (*Jour. Agr. Sci. [England], 20 (1930), No. 1, pp. 117–125*).—An analysis of the bones of young pigs fed a ration composed chiefly of cereal grains with the addition of cod-liver oil was made by the Animal Nutrition Institute, Cambridge, England. These bones showed a very distinct lack of calcification and were about 12 per cent lower in total ash than the bones of normal animals. That calcification proceeded up to maturity was shown by the fact that a difference of 360 gm. of tricalcium phosphate existed between mature bones of normal and calcium-deficient animals. The ratio of lime to phosphate was practically the same in the different bones of the same individual and in the bones of normal and rachitic pigs. On the other hand, the amount of ash in the bones of rachitic pigs was quite low.

A method for removing fat samples from live hogs, E. L. SCOTT and H. W. BLOCK (*Jour. Agr. Research [U. S.], 42 (1931), No. 1, pp. 47–51, figs. 2*).—In this article from the Indiana Experiment Station the procedure followed in removing fat samples from live hogs and the method of handling the hog and sample are discussed.

[Swine experiments at the Matanuska Station], H. W. ALBERTS (*Alaska Stas. Rpt. 1929, pp. 31, 32*).—Pregnant sows on a ration of oat and pea hay, turnips, potatoes, and oat and barley grain developed lameness in the hind quarters, apparently due to a nutritional deficiency. The condition became worse as the period of gestation advanced. Two sows were unable to stand about farrowing time, but nursed their litters for 2 weeks in spite of the fact that they apparently became more helpless. They ate heartily until 2 or 3 days before death, which occurred about 3 weeks after farrowing. Two other sows apparently not so severely affected recovered when turned on green pasture. Boars were not affected by the ailment.

Two pigs, averaging 56 lbs. per head, were turned on pasture on June 28. For the first 10 days they ate young weeds almost exclusively, and then ate oats, peas, and rape in the order named. The pigs received 1 lb. of skim milk per head daily as a supplemental feed. On October 28 the pigs averaged 196.5 lbs. per head.

[Swine experiments in Oklahoma] (*Oklahoma Sta. Rpt. 1927–1930, pp. 78–81, 83–85, figs. 2*).—The results of four studies are briefly noted.

Threshed kafir makes best gains, C. P. Thompson.—Continuing this study (E. S. R., 58, p. 268), it was found that pigs made fairly satisfactory gains on dry kafir heads; but when the heads were soaked the rate of gain was decreased. This was also true of darso heads. Grinding kafir heads increased materially the feed requirements per unit of gain and reduced the rate of gain as compared with whole heads. It required 375 lbs. of ground threshed kafir, properly supplemented with tankage, to produce 100 lbs. of gain, while 830 lbs. of grain in the head, ground and fed moist, were required to produce the same gain.

Mineral may improve swine ration, C. P. Thompson.—Several tests have shown that where such feeds as wheat shorts, low in minerals, are used as a protein supplement to corn, the addition of minerals increases the rate and economy of gains. However, when such feeds as tankage, milk, and linseed meal, which are high in minerals, are used, the addition of a mineral mixture does not increase the efficiency of the ration. There were indications that 2 per cent of minerals had a somewhat injurious effect and, while smaller amounts increased slightly the rate of gain, large quantities decreased the efficiency of the ration. The present indications are that when minerals are added to the ration they should be limited to 1 per cent.

Cottonseed meal may replace some tankage, C. P. Thompson.—Pigs were divided into 5 lots of 12 head each and fed corn with various proportions of tankage and cottonseed meal. The lot receiving cottonseed meal alone gained at the rate of 1.14 lbs. per head daily and required 520 lbs. of concentrates per 100 lbs. of gain. There was little difference between the lots receiving tankage only and tankage and cottonseed meal in the ratio of 3:1, 1:1, and 1:3, respectively.

Outbred hogs outgain inbred hogs, W. A. Craft.—In this study with 60 litters of pigs it was found that the outbred group of litters averaged one more pig per litter and the pigs were slightly heavier at birth than the inbred litters. At 60 days of age both groups weighed about the same, but it required 8 per cent less time for the outbred pigs to reach 225 lbs. in weight. A higher percentage of small pigs farrowed and small pigs surviving was found among the inbred litters, while a greater percentage of large pigs survived in the outbred litters.

The action of activated ergosterol in the chicken, I, II, O. N. Massengale and M. Nussmeier (*Jour. Biol. Chem.*, 87 (1930), No. 2, pp. 415–426).—Two parts are presented.

I. *The effect on the calcium and inorganic phosphorus of the blood serum* (pp. 415–422).—In this study the authors used five lots of four White Leghorn cockerels each, averaging 18 weeks of age. Four lots received a basal ration of yellow corn meal, wheat gluten, casein, linseed meal, and salt 79:10:5:5:1, while the fifth lot received a rickets-producing ration. Lot 1 received no mineral supplement, while, replacing a like amount of corn, lot 2 was fed 6 per cent of calcium carbonate; lot 3, 1 per cent of calcium carbonate and 5 per cent of sodium phosphate; and lot 4, 6 per cent of calcium phosphate. The approximate calcium-phosphorus ratios in the respective rations were 0.32:1, 8:1, 0.38:1, 1.6:1, and 5:1. Weekly determinations were made for calcium and phosphorus in the blood serum of each bird for a period of 8 weeks. At the end of this period 4 per cent of activated ergosterol, potency 1,000 times that of average cod-liver oil, was added to each ration, and the calcium and phosphorus of the blood determined 2, 5, 10, 15, and 35 days after the addition of the ergosterol.

The calcium in the blood serum of the birds in lot 2 increased during the first week and remained above normal for 8 weeks, while the inorganic phosphorus decreased rapidly during the first 3 weeks and then remained approximately stationary. Adding ergosterol brought about a marked increase in calcium, but only a slight increase in phosphorus. The calcium content of the blood of the birds in lot 5 remained normal for about five weeks, but there was a steady decrease in phosphorus. Adding ergosterol to this ration caused the calcium and phosphorus to become about normal. Within 48 hours after the addition of ergosterol to a high calcium rickets-producing ration there was a marked change in the calcium of the blood serum. Both the calcium and phosphorus remained about normal when the calcium-phosphorus ratio was 1.6:1,

and the addition of ergosterol had no marked effect on either until after from 15 to 35 days, when an increase in serum calcium occurred. When the ration was low in both calcium and phosphorus these elements decreased in the blood serum, and when ergosterol was added there was a marked increase in calcium but only a slight increase in phosphorus. After 35 days the calcium was approximately normal, with the phosphorus still subnormal.

II. *The prevention of leg weakness* (pp. 423–426).—Single Comb White Leghorn chicks were divided into 5 lots of 10 each and fed a basal ration of yellow corn, half skim milk powder, wheat bran, linseed meal, wheat gluten, calcium carbonate, and salt 56:10:10:10:10:3:1. Lot 1 received the basal ration only; lot 2, a supplement of 2 per cent of cod-liver oil. In lot 3, half of the chicks received 0.02 per cent of activated ergosterol and the other half the same amount of ergosterol diluted to 2 per cent with corn oil; lot 4, half of the chicks 0.2 per cent of activated ergosterol and the other half the same amount diluted to 2 per cent with corn oil; and lot 5, 2 per cent of activated ergosterol. The birds were housed so they had no access to direct sunlight and were fed their respective rations for 10 weeks, at which time the birds were killed and the percentage of ash in the bones determined.

The average percentages of bone ash per bird in the respective lots were 39.89, 47.22, 41.21, 44.39, and 47.23. In spite of the low ash content, the birds in lot 1 were not suffering from severe leg weakness. The birds receiving the vitamin D equivalent of 2 per cent of cod-liver oil in the form of activated ergosterol had an appreciably lower ash content of bone than the birds receiving cod-liver oil. However, the birds receiving ergosterol had considerably more ash in the bones that the birds receiving no vitamin D supplement.

It is concluded that activated ergosterol, either in concentrated or dilute solutions, was less efficient for preventing leg weakness in chicks than the rat equivalent amount of cod-liver oil.

Flock improvement through selection of hatching eggs, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 19 (1931), No. 4, pp. 4, fig. 1*).—The details of the care and selection of eggs to be used for hatching purposes are discussed in this publication.

[Poultry experiments at the Matanuska Station], H. W. ALBERTS (*Alaska Stas. Rpt. 1929, p. 32*).—A scratch ration composed of cracked corn, sunflower seed, and wheat, and a mash of ground peas, ground charcoal, grit, oyster shell, and crushed eggshell were fed to a flock of Rose Comb Buff Leghorns, consisting of 15 hens and 15 pullets. On December 25, 3 hens began to lay and averaged 1 egg per day until February 16, when the flock averaged 4 eggs daily to March 18. From the latter date to September 1, the average of the flock was 17 eggs per day, and from September 2 to 30, 10 eggs per day. Production declined rapidly during the latter part of September.

[Poultry studies in Oklahoma] (*Oklahoma Sta. Rpt. 1927–1930, pp. 87–94, 96–162, 180, 181, figs. 6*).—A number of experiments are reported.

Grain sorghums are good poultry feeds, R. Penquite.—A series of tests were conducted to determine the comparative values for egg production of rations composed of grain sorghums as the principal cereal, to determine the effect of various feeds on the vitality, mobility, and duration of life of the spermatozoa, and the influence of various feeds on hatchability. In all, 18 different rations were compared.

Fertility did not appear to be significantly affected by the various feeds. It was observed, however, that in pens where the average production was highest during the hatching season the fertility rate was lowest. Observations during the hatching season showed that birds fed feterita and hegari, although producing the largest number of eggs, were not in good physical condition.

Birds fed yellow corn and yellow corn, wheat, and oats were healthy and vigorous, and the birds receiving the yellow corn, while laying fewer eggs, produced more fertile eggs. Kafir supplemented with green feed proved to be equal to yellow corn supplemented with green feed in both egg production and effect on health of birds.

Results of these studies show that green feed supplements stimulate the birds, increase the egg production, and decrease the mortality. Kafir proved to be more efficient for egg production than darso, but both grains could be substituted for yellow corn if green feed or such feeds as carrots and alfalfa hay were fed once daily during the laying period.

All mash or mash and grain good, R. B. Thompson.—Over a period of 3 years, using 5 lots of 48 hens each year, there was no significant difference in the amount of feed consumed, number of eggs laid, size of eggs, or weight of hens in lots fed by the all-mash method and in lots receiving grain and mash. In 2 of the 3 years, the use of lights was not profitable.

High and low protein rations tested, L. Morris.—In this study 6 lots of 100 chicks each were handled in the same manner but during their first 11 weeks fed rations varying in protein content from 14.32 to 23.13 per cent. From 12 to 22 weeks the protein content of the ration varied from 13.04 to 22.24 per cent. The lots receiving the low protein rations weighed less throughout the test than the other lots. There was little difference in the feed consumption of the various lots, but an excessive mortality was common to all lots.

Cottonseed meal for poultry, R. B. Thompson.—Summarizing 3 years' results in this study (E. S. R., 57, p. 568), it is shown that cottonseed meal was a satisfactory protein for laying hens when supplemented with minerals and that it had no toxic effect on the hens. Cooking the meal under pressure did not change these properties so far as hens were concerned. Adding minerals to a mash containing cottonseed meal stimulated the feed consumption. Eggs of uniform high fertility were produced when the mash contained as high as 50 per cent of cottonseed meal. More eggs by weight and count were produced by lots receiving cottonseed meal and minerals than by lots receiving no cottonseed meal. More than 3 per cent of mineral mixture did not affect egg production or yolk color when cottonseed meal made up one-third of the mash. When the components of the mineral mixture were fed separately, salt gave the best results, followed by bone meal, while calcium gave the poorest results. Using from 3 to 6 per cent of hydrated lime in a mash containing 3 per cent of mineral mixture increased egg production and decreased the intensity of the yolk color, but without the mineral mixture had no effect. Excellent eggs for storage purposes were produced when the mash contained 7 per cent of cottonseed meal, but 33.33 per cent of cottonseed meal produced an egg that developed an olive-green yolk during storage.

The olive yolk caused by cottonseed meal was free from bacteria, had no foreign flavor or odor, was wholesome, and changed to yellow when the egg was cooked or the yolk whipped. The H-ion concentration of the yolk is increased and that of the white decreased when cottonseed meal is fed in sufficient quantities to discolor the yolk. Hens receiving 33.33 per cent of cottonseed meal had blood with a high uric acid content. The yolks of eggs produced when cottonseed meal was fed stood up well and were firm, but the albumin was often slightly pink in color and not clear white. Olive yolks increased in size and weight during storage, apparently due to the absorption of water. The ammonia nitrogen and protein nitrogen of olive-yolked eggs were the same as in eggs produced when no cottonseed meal was fed.

Forcing doesn't injure breeding hens, R. B. Thompson and R. Penquite.—In a study with 9 lots of 19 pullets each fed different rations of mash and grain, all mash, or all grain, it was found that moderate forcing for winter egg production did not affect the health of the hen, the body weight, size of egg, fertility or hatchability when the ration was complete and included a daily supply of green feed. Hens fed on an entire grain ration laid light-weight eggs and never developed to full adult size.

Profits follow high egg production, R. B. Thompson.—Based on the results of seven egg-laying contests, it was observed that the greater the number of eggs produced the greater was the return above feed cost, the lower the cost of feed per dozen eggs, and the greater the amount of feed consumed. Culling during the winter months was found to be a doubtful practice, and better results were obtained by eliminating hens that stopped laying from June to October. Peak production was reached during the months of March and April.

Mystery slows egg quality betterment, R. B. Thompson.—Observations made during this incomplete study of poor egg quality and storage losses are noted in this article.

Fiber in ration tested, L. Morris.—In a test covering 1 year, an attempt was made to determine the maximum, minimum, and optimum amounts of fiber for baby chicks, using 6 lots of 100 chicks each. Rations were fed containing from 3.84 to 10.29 per cent of fiber. No effect was noted on the growth or health of the chicks that could be attributed to the amount of fiber in the ration.

Profit doubtful from capons, R. Penquite.—Studies covering a period of 3 years to determine the cost of growing capons from fryer size to different ages showed that there was usually not enough spread between the prices of fryers and capons to make it profitable to raise the latter. The average profit on each lot would have been $10.69 if the birds had been sold as fryers, while the average profit for capons was $2.92. The average mortality of all pens was 18.6 per cent and the average percentage of slips was 18.1. The cheapest gains were produced on a ration of equal parts of cubed yellow corn and kafir with buttermilk ad libitum.

Sorghum smuts prove harmless.—The sorghum heads from a field in which 70 per cent of the heads were infected with a kernel smut were gathered, the number of damaged kernels determined, and the amount of smut estimated. The spores of the smut were fed in balanced rations to young and grown chicks without any apparent effect on the growth, egg production, or hatchability of the eggs.

Fourth World's Poultry Congress, July 22–30, 1930 (*World's Poultry Cong., London, 4 (1930), Conf. Papers, Sects. A, pp. IV+191, pl. 1, figs. 13; B, pp. IV+193–341, pls. 7, figs. 9; D, pp. IV+535–715; E, pp. IV+717–859, pls. 6, fig. 1; F, pp. [2]+861–909, figs. 3; Résumés, pp. [1]+1–42, 69–125*).—The following papers were presented in the various sections. The section on diseases has been noted (E. S. R., 64, p. 176).

Breeding and incubation.—The Effects of Inbreeding on Hatchability, by A. G. Dumon (pp. 1–5); The Fertilization of Hen's Eggs, by G. S. Chiebaroff (pp. 6–11); Possibilities with Regard to Introducing Various Kinds of Periodical Testing of Egg Production in Place of Permanent Testing, by C. Voitellier (pp. 12–18); A Case of Sex-Linked Heredity Disguised by the Ovarian Hormonic Secretion in a Cross between Two Breeds of Domestic Fowls, by F. Caridroit and V. Regnier (pp. 19–22); Incubation Experiments, by L. Weinmiller (pp. 23–31); Relations in Germany between Pedigree Breeding and General Utility Breeding, by A. Schachtzabel (pp. 32–36); Some Experiments Concerning Fecundity, by R. C. Punnett (pp. 37–39); Some Experiments Re-

lating to the Ovarian Function in the Fowl, by A. W. Greenwood and J. S. S. Blyth (pp. 40–43); The Lancashire Breeding Scheme, by T. Barron (pp. 44–47); The Effect of Inbreeding, by J. S. Dunkerly (pp. 48–71); Selection of Egg-Laying Stock from the Crossing of Pure Leghorn Stock with Local Italian Breeds, by A. Taibell (pp. 72–77); Experiments on the Differentiation and Growth of the Cardiac Tissne in Chicken Embryos, by O. M. Olivo (pp. 78–82); The Anatomic Vascular Conditions of the Embryonic Ovaries and Tubes of Birds and Their Functional Significance, by E. Giacomini (pp. 83–87); The Heredity of Various Characteristics in Geese, by A. Vecchi (pp. 88–90); The Life Duration of Cock Spermatozoa outside the Body, by H. Ishikawa (pp. 91–95); Pedigree Breeding for Egg Production with a Flock of White Leghorns, by K. Kimura et al. (pp. 96–100); The Origin of the Barnevelder and Welsummer Breeds, and Some Egg Production Figures of the Principal Dutch Utility Breeds, by P. J. Wijk and P. Ubbels (pp. 101–112); External Characteristics in Fowls in Connection with Purity of Race, by C. S. T. van Gink (pp. 113–115); Different Ways in Which a Geneticist Can Co-operate with Poultry-Breeders, by A. L. Hagedoorn (pp. 116–119); Some Considerations on Variation in Egg-Shell Weight and Its Relation to Egg Weight, by R. de Escauriaza (pp. 120–125); Should There Be a Limit to Selection in Laying Hens? by F. Font y Mateu (pp. 126, 127); Genetics and Biology of the Creeper (Scotch Dumpie) and the Frizzle Fowl, by W. Landauer (pp. 128–133); Linkage Relations between Genes for Egg Size and Genes Concerned in High Fecundity in Domestic Fowl, by F. A. Hays (pp. 134–138); The Humidity Factor in Incubation, by T. S. Townsley (pp. 139–147); Inheritance of Vigour in the Domestic Fowl, by D. C. Warren (pp. 148–153); Twenty Years' Results of Breeding High and Low Line Leghorns at Cornell University Experiment Station, by G. O. Hall and D. R. Marble (pp. 154–166); The Inheritance of Hatchability, by M. A. Jull (pp. 167–173); Time of Occurrence and Probable Causes of Mortality in Chick Embryos, by T. C. Byerly (pp. 174–181); and The Economic Significance of Variations in Weights of Eggs Laid by Individual Hens in Poultry Flocks, by W. C. Thompson (pp. 182–191).

Nutrition and rearing.—Ultra-violet Rays and Poultry Husbandry, by C. Bouhon (pp. 193–196); Nutrition and Hatchability, by W. R. Graham (pp. 197–200); Successful Experiments in the Modification of the Embryonic Nourishment of the Chicken, by L. Bouges (pp. 201–204); Some Experiments in Feeding Poultry, by T. Newman (pp. 205–208); The Rôle of Fibre in Poultry Feeding, by E. T. Halnan (pp. 209–213a); The Value of Cod Liver Oil in the Ration for Egg Production, by R. T. Parkhurst (pp. 214–219); Factors Affecting Size and Iodine Content of the Thyroid in Fowls, by E. M. Cruickshank (pp. 220–223); The Nutrition of the Chick and Its Effect on Growth, Maturity, Egg Production, and Mortality, by J. H. Prentice, R. G. Baskett, and G. S. Robertson (pp. 224–233); Recent Research in Poultry Nutrition, by A. Macdonald and J. B. Orr (pp. 234–240); Some Protein Foods for Poultry, by E. B. Lomax (pp. 241–244); The Relative Suitability of Certain Breeds for Table Poultry Production, by C. E. Fermor (pp. 245–249); The Influence of Iodine in the Nutrition of Poultry, by F. C. Kelly (pp. 250–254); The Optimum Concentration (Starch Equivalent) of the Meal Mixture for Chickens and Growing Pullets Fed on All-Mash Diet, by E. J. Sheehy and K. Sheil (pp. 255–261); The Attenuating Influence of Blood on the Action of the Thyroid Secretion, Demonstrated Experimentally in Chickens, by E. Giacomini (pp. 262–265); Soy Bean Cake as Protein Supplement of Poultry Feed, by K. Suzuki and T. Hatano (pp. 266, 267); The Nutrition of Egg-Laying Hens, by N. Hansson (pp. 268–277); A Study of Squab and Pigeon Flesh Particularly with regard to the Distribution of Protein, by R. C. Elmer, F. C. Hilberg, and P. E. Howe (pp.

278–284); The Early Growth of Chickens as a Function of Feed Consumption Rather than of Time, by H. W. Titus and W. A. Hendricks (pp. 285–293); The Antirachitic Potency of Cod Liver Oil when Mixed and Stored in Feed Six and Twelve Months, by L. F. Payne (pp. 294–300); The Minimum Nutritive Requirements of Single Comb White Leghorn Chickens, by H. H. Mitchell, L. E. Card, and T. S. Hamilton (pp. 301–306); The Influence of the Protein Level on the Rate of Growth in Chickens, by G. F. Heuser and L. C. Norris (pp. 307–316); The Limitations of Vitamin D in the Production of Hatchable Eggs, by R. M. Bethke and D. C. Kennard (pp. 317–323); Keeping Chickens in Confinement, by D. C. Kennard and R. M. Bethke (pp. 324–329); Some Chemical Factors Governing Egg Formation in the Hen, by G. D. Buckner, J. H. Martin, and W. M. Insko, jr. (pp. 330–333); and The Confinement Method of Poultry and Turkey Management, by H. C. Knandel (pp. 334–341).

Economics (including marketing).—The Commerce and Marking of Eggs in Belgium, by V. Pulinckx-Eeman (pp. 535, 536); The Belgian Egg Trade, by M. F. Mannes (pp. 537–539); Co-operation in the Marketing of Eggs and Poultry in the Province of Saskatchewan, by W. Waldron (pp. 540–544); Co-operative Marketing—Its Contribution to the Canadian Poultry Industry, by W. A. Landreth (pp. 545–549); Farm Survey Records and Flock Management Problems in British Columbia, by E. A. Lloyd and W. J. Riley (pp. 550–558); Poultry on General Farms, by A. W. Ashby (pp. 559–572); Egg and Poultry Prices in Great Britain, by A. W. Ashby (pp. 573–580); The Marketing of Eggs in Northern Ireland, by S. Smith (pp. 581–585); The Production and Marketing of Eggs in Scotland, by A. F. Smith (pp. 586–590); The British Market for Imported Eggs, by E. W. Sutherland (pp. 591–596); The British Market for Imported Table Poultry, by A. S. Juniper (pp. 597–600); Some Aspects of the London Retail Egg Trade, by A. L. Hunt (pp. 601–604); The Marketing of Poultry Products under the National Mark, by A. W. Street (pp. 605–613); Statistical Data on the Production and Trade in Poultry and Eggs in Various Countries (pp. 614–635); The Marketing of Irish Free State Eggs and Poultry, by H. W. Stevens (pp. 636–641); The Egg and Poultry Trade in Italy, by C. Faccincani (pp. 642–646); The Italian Cold Storage Industry in Relation to the Egg and Poultry Trade, by R. Vallarini (pp. 647, 648); The Egg Trade in the Netherlands and Its Control, by B. H. Vos (pp. 649–655); The Poultry Industry in Portugal and Its Possibilities, by Manuel L. A. R. de Bragança, (pp. 656–658); Some Marketing Aspects of the Poultry Industry in the Union of South Africa, by C. H. Spamer (pp. 659–662); The Economic Importance of the Frozen Egg Industry in the United States, by A. D. Greenlee (pp. 663–666); Sales Programme of Pacific Egg Producers, Car Allotment and Foreign Distribution, by E. W. Benjamin (pp. 667–672); The Problems of Buying Eggs from Producers on a Grades Basis, Historically Traced, by A. F. Peine (pp. 673–678); The Place and Problems of the Commercial Agency in Reporting Poultry and Egg Markets in New York City, by C. A. Urner (pp. 679–685); The Foreign Trade of the United States in Poultry and Eggs, by M. A. Wulfert (pp. 686–690); The Development and Scope of a Governmental Market News and Grading Service for the Poultry and Egg Industry, by L. M. Davis and R. R. Slocum (pp. 691–699); How an Egg, Feed, and Poultry Co-operative Operates in Central California, by J. Lawler (pp. 700–704); Educational Functions of the Press in the Poultry Marketing Industries, by P. Mandeville (pp. 705–709); The Function and Operation of the Chicago Mercantile Exchange, by C. J. Eldredge (pp. 710–713); and The Canning of Whole Chicken, by E. J. Cashman (pp. 714, 715).

Education and general.—Poultry Husbandry in Bulgaria and Public Measures for Its Advancement, by G. S. Chlebaroff (pp. 717–723); Record of Merit for

Turkeys, by G. M. Cormie (pp. 724–729); Danish Egg Production and Export, by H. Faber (pp. 730–732); Poultry Husbandry in Denmark, by W. A. Kock (pp. 733–736); Avicultural Instruction in France, by E. Blanchard (pp. 737–740); Aviculture and Natural Science, by Count Delamarre de Monchaux (pp. 741–743); Turkey Rearing in France, by G. Legendre (pp. 744–746); The Training of Women in Poultry Farming and Their Prospects in Agricultural Work, by Frau von Treuenfels-Damerow (pp. 747–749); Some Problems in the Conduct of Egg Laying Trials, by C. Crowther (pp. 750–756); The Management of the Egg Laying Duck, by H. B. Carrington (pp. 757–762); The Influence of Laying Trials on the Improvement of British Poultry, by J. E. Helm (pp. 763–766); The Work and Influence of the National Institute of Poultry Husbandry of England and Wales, by R. T. Parkhurst (pp. 767–770); Poultry Education and Research in England and Wales, by H. E. Dale (pp. 771–774); The Origin and History of the Indian Runner Duck, by M. Chisholm (pp. 775–777); Poultry Development in Northern Ireland, by J. Getty (pp. 778–784); Poultry Education in Scotland, by A. Kinross (pp. 785–788); Aviculture in Greece; by J. G. Antoniades and D. Zografos (pp. 789–793); Present Day Poultry Farming in Hungary, by A. Kelemen (pp. 794–798); The Feeding of Poultry in the Tropics, by Mrs. A. K. Fawkes-Ansell (pp. 799–801); Instruction in Poultry Keeping in the Irish Free State, by M. Hennerty (pp. 802–808); Government Poultry Stations in the Italian Provinces and Their First Results (pp. 809–813); The Co-operative Organization of the Poultry Industry in Italy According to the Aims of the National Fascist Confederation of Agriculturists, by A. Ghigi (pp. 814, 815); Japanese Poultry Breeds, by Y. Kinugawa (pp. 816–819); The Annual Replacement of Poultry Livestock for Egg Production, by J. G. Tukker (pp. 820–826); The Instruction of Dutch Farmers in Poultry Keeping, by J. S. Keyser (pp. 827–829); Poultry Improvement Methods in Poland, by M. Trybulski (pp. 830, 831); The Swiss Method of Judging Utility Breeds of Poultry According to Their Outward Appearance, by J. H. Heusser (pp. 832–837); Poultry Breeding in Switzerland, by K. Kleb (pp. 838–841); The Organization of a Poultry Extension Programme, by H. L. Shrader (pp. 842–849); What the American Farm Woman Has Done and Can Do with Poultry, by Mrs. G. B. Simmons (pp. 850–854); and Management and Nutrition Problems of Battery Brooding, by H. A. Bittenbender (pp. 855–859).

Rabbits.—Rabbit Breeding in Belgium and the Co-operative Sale of Products, by H. M. Tilmanne (pp. 861, 862); The Production and Marketing of Rabbit Skins, by W. Brumwell (pp. 863–867); Some Husbandry Conditions Affecting Growth in the Rabbit, by W. K. Wilson (pp. 868–875); The Control of Fertility in the Rabbit, by J. Hammond (pp. 876–880); The Growth of Angora Rabbit Hair, by G. K. Chambers (pp. 881–885); Angora Wool Production, Past and Present, by J. B. McDougall (pp. 886–889); Some Diseases of Rabbits, by H. Gray (pp. 890–895); and The Development of the British Rabbit Industry (pp. 896–900), and A Preliminary Study of Some of the Factors Influencing the Duration of Pregnancy and Litter Size in the Rabbit (pp. 901–909), both by J. N. Pickard.

Résumés of these papers are published under separate cover.

DAIRY FARMING—DAIRYING

Investigations in the feeding of cottonseed meal to cattle, J. O. Halverson and F. W. Sherwood (*North Carolina Sta. Tech. Bul. 39 (1930), pp. 158, figs. 44*).—Concluding this series of studies (E. S. R., 59, p. 772), it has been shown that typical cottonseed meal poisoning symptoms can be produced in cows by feeding peanut meal, linseed meal, or soybean meal with a mineral

mixture and a poor roughage. These results indicate that the condition is not due to a toxic substance in the cottonseed meal.

Evidence is presented to show that the failure of the cows on rations of the above type was due to a deficiency of vitamin A. A ration of cottonseed meal and wheat straw with or without 6 per cent of green feed proved inadequate for maintenance, the results suggesting a shortage of vitamin A and calcium. A ration of cottonseed meal, minerals, timothy hay, corn silage, and cottonseed hulls did not maintain the health and vigor of milking cows, but when alfalfa hay was substituted for timothy hay the ration was improved, as was also the reproduction of the cows. When three-fourths of the entire ration consisted of equal parts of cottonseed hulls, corn silage, and alfalfa hay with cottonseed meal and minerals with or without white corn, the ration was adequate for milking cows over a period of 175 days. When beet pulp was substituted for corn silage, the roughage ration was not adequate for supplying the deficiencies of the concentrates over an extended feeding period. Poor health in 5 of 10 cows resulted in the feeding of such a ration, but reproduction was almost normal and milk production was good. A roughage ration of cottonseed hulls, beet pulp, corn silage, and timothy hay did not adequately supplement a concentrate ration of cottonseed meal and minerals with or without white corn. In a ration with beet pulp and cottonseed hulls, 27 per cent of alfalfa hay was not completely adequate for furnishing the needs of dairy cows.

The combined results of these studies show that the deficiencies of cottonseed meal or cottonseed meal and white corn may be supplied by the roughage portion of the ration when fed in sufficient quantities to supply the necessary nutrients.

Corn silage versus a mixture of wet beet pulp and molasses for milk production, C. F. Monroe, C. C. Hayden, and A. E. Perkins (*Ohio Sta. Bimo. Bul. 148 (1931), pp. 3–8, figs. 2*).—This is a more detailed account of work previously noted (E. S. R., 63, p. 668).

Does the feeding of corn silage to dairy cows lead to acidosis? A. E. Perkins, C. C. Hayden, and C. F. Monroe (*Ohio Sta. Bimo. Bul. 148 (1931), pp. 8–11*).—A minimum of 10, and in most cases 30, samples of urine from the cows in the above study were analyzed. The determinations for cows receiving from 30 to 50 lbs. of corn silage in addition to grain mixture and alfalfa hay over a long period of time showed no evidence of acidosis. The amount of bicarbonates present in the samples was not greatly different for the various rations. The ammonia content, while higher on the heavy silage ration, was not above the upper limit of what is considered normal. The urine of cows on a heavy silage ration was not significantly higher in organic acids than the urine of cows fed beet pulp. These results indicate that a heavy feeding of silage in connection with alfalfa hay and a grain mixture does not bring about acidosis in cows.

[Dairy cattle experiments at the Matanuska Station], H. W. Alberts (*Alaska Stas. Rpt. 1929, pp. 29–31*).—The average yield of milk of the three best Holstein cows during the first 100 days of the lactation period was 3,085.4 lbs., testing approximately 3.8 per cent of fat. The average yield of the three best Galloway-Holstein cows during the first period was 4,152.7 lbs. of milk, testing about 4.3 per cent of fat. These animals were fed a mixture of ground barley, ground oats, and linseed meal 3 : 3 : 1 at the rate of 1 lb. of mixture for each 4 lbs. of milk produced, and in addition they received about 35 lbs. of oat and pea silage and 10 lbs. of oat and vetch hay per 1,000 lbs. of live weight. A limited quantity of root crops was also fed.

Dry cows and young stock made satisfactory gains on a ration of 30 lbs. of oat and pea silage and 10 lbs. of oat and wheat straw per 1,000 lbs. of live weight.

[**Dairy cattle studies in Oklahoma**] (*Oklahoma Sta. Rpt. 1927–1930, pp. 163–173, figs. 2*).—The results of five studies are noted.

Mung bean hay for milk production, A. H. Kuhlman, P. C. McGilliard, and E. Weaver.—Mung bean hay and alfalfa hay were fed during alternate 20-day periods to 8 dairy cows. In addition, the cows received a grain mixture and dried beet pulp. While on alfalfa hay, it required 34.4 lbs. of hay, 38.1 lbs. of grain, and 25.2 lbs. of beet pulp to produce 100 lbs. of milk, and while on the basis of mung bean hay actually consumed it required 30.4 lbs. of hay, 38.4 lbs. of grain, and 25.2 lbs. of beet pulp to produce 100 lbs. of milk. The actual consumption of mung bean hay represented only 71 per cent of the stack-run hay, which gives it a value of about 80 per cent that of alfalfa hay. While receiving alfalfa hay the cows produced an average of 24.85 lbs. of milk daily, testing 3.94 per cent fat, and while receiving mung bean hay 24.4 lbs. of milk, testing 3.69 per cent fat.

What blood tells in the dairy, A. H. Kuhlman, P. C. McGilliard, and E. Weaver.—Preliminary results of a study of grading up dairy cattle from scrub cows is reported in this article.

Cottonseed meal rations may upset old theories, A. H. Kuhlman and E. Weaver.—Grade Jerseys that had been fed cottonseed meal from the time they were 30 days old consumed an average of 6.2 lbs. of cottonseed meal during their gestation period. The oldest group of 6 heifers all conceived at the first service, while in the second group 3 animals conceived at the first service and 2 were bred a second time. None of the freshening animals have shown any unusual conditions at parturition, the udders were soft and pliable within a few days, and no udder troubles were experienced during lactation. The milk production has been similar to that of normal first-calf Jersey heifers.

Cost of milk production, P. C. McGilliard and E. Weaver.—The feed cost per 100 lbs. of milk produced by 28 cows of different breeds of dairy cows, based on current feed prices, was as follows: Ayrshires, $1.58; Guernseys, $1.51; Holsteins, $1.45; and Jerseys, $1.68. The feed cost per pound of butterfat was: Ayrshires, 36 cts.; Guernseys, 34; Holsteins, 44; and Jerseys, 32 cts.

Mangels and corn silage for cows, A. H. Kuhlman, P. C. McGilliard, and E. Weaver.—Two trials of 45 and 90 days, respectively, were made to compare mangels and corn silage as succulent roughages for dairy cows. In the first trial mangels were substituted pound for pound for corn silage, each fed at the rate of 3 lbs. per 100 lbs. of live weight with a grain mixture and alfalfa hay. In a second trial 5 lbs. of mangels were substituted for 3 lbs. of silage. The cows fed mangels consumed more succulent feed, grain, and hay to produce 100 lbs. of milk than the cows fed corn silage. In the first test the milk of the cows fed mangels averaged 4.98 per cent of fat and for the silage-fed cows 5.02 per cent of fat, while in the second test these percentages were 3.87 and 3.88, respectively.

Factors affecting the yield and quality of milk.—II, Variations in successive lactations, J. Glen and A. C. M'Candlish (*Jour. Agr. Sci.* [*England*], *20* (*1930*), *No. 1, pp. 45–52*).—Continuing this study at the West of Scotland Agricultural College (E. S. R., 62, p. 664), it was found that milk and butterfat production rose to about the sixth lactation, but that beyond the fifth lactation the rise was negligible. On this basis, maximum production was obtained in the fifth lactation, or at approximately 7 years of age. Milk and fat yields varied irregularly after the fifth lactation, but showed a downward

tendency. The total yield of fat showed either a fall or a very slight increase during the second lactation, while the fat percentage was highest in the first lactation, dropped noticeably in the second, remained approximately the same for several periods with a slight downward tendency, and then fell off markedly during the higher lactations.

Comparable results were obtained by applying correction factors for either age or lactation, and the choice of method would depend upon the original data available.

Fat-soluble vitamins, XXVIII, XXIX (*Jour. Biol. Chem., 87 (1930), No. 1, pp. 103–126, 127–137, figs. 2*).—These papers continue this series of studies at the Wisconsin Experiment Station (E. S. R., 57, p. 392).

XXVIII. *The antirachitic value of cow's milk as modified by exposure of the cow to sunlight and to radiations from a quartz mercury vapor lamp*, H. Steenbock, E. B. Hart, B. M. Riising, C. A. Hoppert, S. Basherov, and G. C. Humphrey.—Cows were exposed daily to sunshine or for 1 hour daily at a distance of from 20 to 30 in. to the rays of an ultra-violet lamp, with the radiations falling on the head, back, or udders. Ayrshire and Holstein cows with coats for the most part unpigmented were used in these tests. Rats were fed the milk of these cows to determine both the prophylactic and curative properties.

The results showed no improvement in the milk or butterfat secretion that could be attributed to the radiation. It is concluded that the superior quality of milk produced during the summer was dependent upon factors other than sunlight acting directly upon the cow.

XXIX. *Is antirachitic activation induced by ultra-violet radiations a panacea for negative calcium balances?* H. Steenbock, E. B. Hart, B. M. Riising, S. W. F. Kletzien, and H. T. Scott.—In an effort to check results previously obtained with goats (E. S. R., 56, p. 771), a white goat that had been confined in a barn all winter was placed in a metabolism cage. Care was taken to prevent the animal from obtaining activated compounds. The goat was irradiated 30 minutes daily with a quartz mercury vapor lamp at a distance of from 6 to 8 in., and the prophylactic and curative properties of the milk were determined with rats.

Exposure to the radiations of the quartz mercury vapor lamp increased decidedly the antirachitic properties of the milk. While at the beginning of the irradiation there was a slight improvement in calcium retention, it was observed that ultimately the goat showed a very decided negative calcium balance. Since there was a simultaneous increase in the restlessness of the animal with the occurrence of the pronounced negative calcium balance, it appeared that the excretory elimination of calcium may be controlled neurologically as well as by the antirachitic factor. On the basis of these results, it is concluded that antirachitic activation can not be used as a cure-all for a disturbed calcium metabolism.

Standard methods of milk analysis, bacteriological and chemical (*New York: Amer. Pub. Health Assoc., 1927, 5. ed., pp. VI+68, figs. 14*).—This is the fifth revised edition of these methods (E. S. R., 51, p. 579).

The cost of cooling milk with electricity, E. O. Anderson (*Connecticut Storrs Sta. Bul. 170 (1930), pp. 23, figs. 2*).—A study was made of the cost of cooling milk in wet storage type cooling tanks on seven farms for a period of one year. The milk was cooled to a temperature between 38 and 45° F. A depreciation of 10 per cent was charged against both the tank and the compressor, and interest was figured at the rate of 5 per cent. The average investment was $343.57 for the cooling unit and $125.41 for the tank.

The average total cost to cool 100 lbs. of milk was 15.07 cts. When manual control of the cooling unit was exercised, it required 1.106 kw. hours of power to cool 100 lbs. of milk, but when the compressor was automatically controlled it required 1.096 kw. hours. The average number of kilowatt-hours of power required to cool 100 lbs. of milk in this study was 1.103.

Operation and care of cream separator, F. W. ATKESON and D. L. FOURT (*Idaho Sta. Circ. 61 (1930), pp. 16, figs. 10*).—Suggestions for the efficient operation, adjustment, and care of cream separators are discussed in this publication.

Frozen sweet cream as an ingredient of ice cream, M. J. MACK (*Massachusetts Sta. Bul. 268 (1930), pp. 183–193, figs. 5*).—Concluding this study (E. S. R., 63, p. 569), it was found that storing frozen cream for use later in ice cream was a satisfactory method of handling surplus cream. The initial quality and the length and temperature of storage determined the quality of the frozen product. It was recommended that such cream be stored for less than 6 months at below 0° F.

The use of frozen cream reduced the whipping properties of the mix, and such mixes had a lower maximum overrun than sweet cream mixes. The frozen cream mixes had a higher viscosity and contained slightly larger and more irregular sized fat globules and clumps than sweet cream mixes. Adding 0.5 per cent of gelatin or homogenizing before freezing produced little improvement in the whipping and ice cream making properties of frozen cream mixes.

When cream was frozen with 10 per cent of sugar it melted more rapidly and had a lower viscosity and a more uniform body than plain frozen cream. Mixes made with sweetened frozen cream were superior in flavor, whipped faster, had a lower viscosity, and contained smaller fat globules and clumps than mixes made with plain frozen cream.

Packaged ice cream, K. E. WRIGHT (*Massachusetts Sta. Bul. 269 (1930), pp. 195–206, figs. 4*).—Factory-packaged ice cream (E. S. R., 63, p. 569) has been accepted slowly, due to its lighter weight and poor texture. These studies indicate that the weight problem could be overcome by drawing the mix at about 50 per cent overrun, by increasing the percentage of butterfat, by reducing the price to a weight basis, or by a combination of these factors. The texture of the packaged ice cream was largely dependent upon the texture of the semifrozen product at the beginning of the hardening period, and this factor was of more importance than the rate of freezing in the ordinary freezer or in the hardening room. The size of the crystals which determined texture appeared to be influenced by a specific range of temperature depending upon the mix rather than by a progressive lowering of the drawing temperature. The texture improvement brought about by the addition of gelatin and aging was due to the aging of the gelatin, and the most noticeable improvement was found when a warm initial aging temperature was used.

Retarding the overrun of easily whipped mixes was necessary in order that they could be drawn at the proper consistency, and the substitution of butter for part of the cream was found to be the most effective practical means of retarding the overrun.

VETERINARY MEDICINE

Sixteenth report of the director of veterinary services and animal industry, P. J. DU TOIT ET AL. (*Union So. Africa Dept. Agr., Rpt. Dir. Vet. Serv. and Anim. Indus., 16 (1930), pp. 1–263, pl. 1, figs. 104; pp. 335–363, figs. 26; pp. 525–529, fig. 1; pp. 585–588, figs. 4*).—In this annual report (E. S. R., 63, p. 170)

the following contributions are presented: A Short Note on Chronic Anaplasmosis and Gonderiosis in Small Ruminants after Splenectomy, by G. de Kock (pp. 3–10); A Contribution to the Study of "Immunity" in Bovine Trypanosomiasis, by B. S. Parkin and H. E. Hornby (pp. 11–20); A Study of Bovine Trypanosomiasis (pp. 21–53) and Antimony Therapy in Equine Trypanosomiasis (*Trypanosoma brucei*) (pp. 55–60), both by B. S. Parkin; A Note on the Serological Diagnosis of *Trypanosoma congolense* Infection, by E. M. Robinson (pp. 61–67); A Short Note on the Spirochaetal Wound Infection of Pigs, by W. O. Neitz and A. S. Canham (pp. 69–80); The Immunization of Horses against Horsesickness by the Use of Formalized Virus, by P. J. du Toit and R. A. Alexander (pp. 85–104); The Bacteria of the *Clostridium botulinum* C and D types, by E. M. Robinson (pp. 107–142); A Strain of *Mycobacterium tuberculosis* from the Giraffe and Further Observations of *M. tuberculosis* from the Koodoo and the Duiker, by G. Martinaglia (pp. 143–145); A Note on the Addition of Glycerine as a Preservative for Anthrax Spore Vaccine, by J. G. Bekker (pp. 147, 148); New Genera and Species of Mallophaga from South African Hosts, by G. A. H. Bedford (pp. 153–173); Studies on the Bionomics of the Free-Living Stages of *Trichostrongylus* spp. and Other Parasitic Nematodes (pp. 175–198) and A Note on the Preservation of Engorged Female Ticks (pp. 199, 200), both by H. O. Mönnig; A Spirurid (*Streptopharagus geosciuri* sp. nov.) from the Stomach of the Cape Ground Squirrel (*Geosciurus capensis*) (pp. 201–204), The Generic Position of *Oxyuris polyoon* von Linstow, 1909, in the Subfamily Oxyurinae Hall, 1916 (pp. 205–210), An Acuaria (*Acuaria martinagliai* sp. nov.) from a South African Weaver (*Hyphantornis* sp.) (pp. 211–215), A New Nematode (*Rictularia aethechini* sp. nov.), a Physaloptera and an Acanthocephala from the Hedgehog (*Aethechinus frontalis*) (pp. 217–232), On Two New Helminths from the Abomasum of the Bushbuck in Zuzuland, Natal (pp. 233–241), and A Preliminary Communication on the Life Cycle of *Cotylophoron cotylophorum* and Its Pathogenicity for Sheep and Cattle (pp. 243–253), all by P. L. le Roux; Tsetse-Fly Survey of Zuzuland and Surrounding Territories, by J. L. Papert (pp. 255–263); A Study of a Case of Aleucaemia in the Dog, by P. J. J. Fourie and T. Ziehn (pp. 337–360); Cystic Osteo-chondroma of the Testicle in a Stallion, by J. Quinlan (pp. 361–363); A Short Study of the Isotonicity of Sheep Blood, by S. D. Rossouw (pp. 525–529); and Anatomical Studies No. 17: Epidermoid Cysts in Domesticated Animals, by H. H. Curson and A. D. Thomas (pp. 585–588).

[Studies in comparative pathology in Japan] (*Jour. Japan. Soc. Vet. Sci., 9 (1930), No. 4, pp. 309–350, pls. 5, figs. 5*).—The contributions here presented (E. S. R., 64, p. 378) include Studies on the Fowl Paralysis, Part I, by O. Emoto and K. Miyamoto (pp. 209–326); Studies on the Contagious Pleuropneumonia in Cattle—IV, Statistical Observation on the Site of Lung Lesions, by S. Yamagiwa and H. Anbo (pp. 327–337; Eng. abs., pp. 336, 337); and Investigations on Immune Isoreactions of the Blood of Korean Cattle, by J. Nakamura (pp. 338–350; Ger. abs., pp. 348–350).

An hut-ecological note on the poisonous "gifblaar" (Dichapetalum cymosum) (Hook) Engl., A. O. D. Mogg (*So. African Jour. Sci., 27 (1930), pp. 368–375, pls. 2*).—Field observations of the plant *D. cymosum* have shown that the poisoning on the veld at two different periods of the year is due to its producing young shoots twice each season, these shoots being extremely toxic.

Tissue specificity in anthrax infection, V. Burke and L. A. Barnes (*Jour. Immunol., 20 (1931), No. 2, pp. 173–177*).—The authors have found that the gelatinous infiltration in the subcutaneous tissue characteristic of anthrax infection occurs where the organisms are deposited regardless of the location

of the needle puncture through the skin. The pathogenicity of *Bacillus anthracis* is not specific for the skin.

Bacillus welchii and bowel lesions, with special reference to a case of coccidiosis, H. W. BENNETTS (*Aust. Vet. Jour., 6 (1930), No. 4, pp. 153, 154*).—The author suggests that anaerobic toxemia due to the proliferations of organisms, particularly of the *B. welchii* type, in the contents of the small intestine is a factor in the fatal termination of some cases of disease in livestock which are associated with intestinal lesions. A description is given of a case of coccidiosis in a hen, characterized by great proliferation of *B. welchii* in the small intestine. In the author's opinion the *B. welchii* toxemia contributed to the fatal termination of this disease.

The rapid macroscopic agglutination test for Bang's disease, R. GWATKIN (*Jour. Amer. Vet. Med. Assoc., 78 (1931), No. 1, pp. 88–91*).—The author found in the 10 groups here reported upon, the regular test being considered as standard, that the rapid method gave no reaction with 10 positive sera and a positive reaction with 6 negative samples, a difference of 5.6 per cent. Including variations as between suspicious and positive and suspicious and negative, 10.2 per cent differed from the regular test. In addition to these, 100 samples were tested without the application of heat and 15 positives failed to show any reaction by the rapid method (15 per cent). Heat, agitation of the mixture, and the area over which the fluid is spread appear to be factors that influence the amount of reaction manifested by the serum-antigen mixtures.

Animal infections with bacteria of the genus Brucella and their relation to undulant fever of man, J. TRAUM (*Amer. Jour. Pub. Health, 20 (1930), No. 9, pp. 935–942*).—This is a contribution from the California Experiment Station.

Cutaneous hypersensitiveness in guinea-pigs infected with Brucella abortus, A. C. S. STROEM (*Jour. Infect. Diseases, 48 (1931), No. 2, pp. 167–175*).—In investigations conducted, guinea pigs infected with *B. abortus* showed cutaneous hypersensitiveness to abortin even when gross anatomic lesions were absent. Those infected with one strain of the organism showed cutaneous hypersensitiveness to abortin prepared from five other strains. Guinea pigs inoculated with heat-killed vaccine or with a mixture of vaccine and kieselguhr did not show cutaneous hypersensitiveness to abortin. Those infected with *B. abortus* always gave negative reactions with tuberculin. Tuberculous guinea pigs gave slight, somewhat atypical reactions with abortin, presumably due to increased nonspecific hypersensitiveness.

Handbook of pox vaccination and control, edited by O. LENTZ and H. A. GINS (*Handbuch der Pockenbekämpfung und Impfung. Berlin: Richard Schoetz, 1927, pp. VIII+906, pls. 7, figs. 108*).—This work on pox in man and the domestic animals consists of three parts. Part 1 (pp. 1–224), which deals with the disease as it occurs in both man and the lower animals, includes six contributions by as many authors—Von Einsiedel, U. Friedemann, W. Zwick, C. Benda, E. Hieronymi, and H. A. Gins. Part 2 (pp. 225–705), on the specific prophylaxis of pox, consists of nine contributions by nine authors—E. Holländer, H. A. Gins, E. Paschen, A. Groth, E. Peiper, A. Czerny and H. Opitz, O. Lentz, and Breger. Part 3 (pp. 706–895), on the results of experimental research on pox, includes four contributions by three authors—E. Gildemeister, H. A. Gins, and G. Sobernheim.

The classification of the piroplasms of the domesticated animals [trans. title], A. DONATIEN and F. LESTOQUARD (*Rec. Méd. Vét. Exot., 3 (1930), No. 1, pp. 5–20, figs. 2; abs. in Trop. Vet. Bul., 18 (1930), No. 4, p. 117*).—An outline classification is given of the Piroplasmidae, represented by 2 genera and 11

species; Theileridae, represented by a genus and 5 species; and Anaplasmidae, represented by a genus and 2 species.

A new drug for the treatment of the piroplasmoses [trans. title], A. THEILER (*Bul. Soc. Path. Exot., 23 (1930), No. 5, pp. 506–529, figs. 22; abs. in Trop. Vet. Bul., 18 (1930), No. 4, pp. 118–120*).—The value of trypan blue in the treatment of piroplasmoses, both natural and experimental, is dealt with.

Immunization of bovines against the piroplasmoses [trans. title], W. L. YAKIMOFF (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 119 (1930), No. 1–2, pp. 48–70*).—Accounts are given of theilerization against *Babesiella bovis* (pp. 48–63) and immunization against *Piroplasma bigeminum* in Northern Caucasus (pp. 63–68), with notes on theilerization (pp. 68–70.)

[Dermacentor andersoni and Rocky Mountain spotted fever] (*Cong. Rec., 74 (1931), No. 39, p. 3634–3638*).—This is a digest of information presented to the United States Senate by Senator T. J. Walsh of Montana, which includes a review of the present status of this tick and the disease which it transmits prepared by R. R. Spencer, of the U. S. Public Health Service, and a report by S. B. Osborn, commissioner of health of the State of Connecticut.

A tick-destroying agent: Observations on the use of a solution of sodium arsenite containing arsenic at the rate of 6 lb. per 400 gallons, J. LEGG (*Aust. Vet. Jour., 6 (1930), No. 4, pp. 146–152*).—The author reports upon the use of a dipping solution of sodium arsenite of 0.15 per cent strength and its effect on *Boophilus australis* under field conditions.

The ectoparasites of cattle, H. VELU (*Les Parasites Externes du Bétail. [Rabat, Morocco]; Dir. Gén. Agr., Com. et Colon., Serv. Élevage, 1930, pp. 52+[2], figs. 7*).—This is a practical account of the principal ectoparasites of cattle, their injury, and means of control.

Common animal parasites injurious to sheep in eastern Canada, A. E. CAMERON, R. L. CONKLIN, and L. STEVENSON (*[Ottawa]: Dominion Dept. Agr., [1930], pp. 46, figs. 22*).—This is a practical account.

Black disease (infectious necrotic hepatitis) of sheep in Australia, A. W. TURNER (*Aust. Council Sci. and Indus. Research Bul. 46 (1930), pp. 141, figs. 52*).—This is an extended account, a digest of which has been noted (E. S. R., 63, p. 874), of studies of a toxemia induced by a specific bacterium (*Bacillus oedematiens*) in hepatic lesions resulting from the migration of young liver flukes (*Fasciola hepatica*). A bibliography of 140 titles is included.

The bacillus of swine erysipelas associated with arthritis in lambs, H. MARSH (*Jour. Amer. Vet. Med. Assoc., 78 (1931), No. 1, pp. 57–63*).—The author found *Erysipelothrix rhusiopathiae* to be the causative agent in two outbreaks of chronic arthritis in lambs. The disease was reproduced in lambs by intravenous inoculation, but experimental umbilical inoculation failed to produce it. On one ranch where the arthritis occurred, careful disinfection of navels apparently prevented recurrence of the disease.

A study of the species of Eimeria occurring in swine, D. P. HENRY (*Calif. Univ. Pubs. Zool., 36 (1931), No. 6, pp. 115–126, pls. 2*).—In a study of swine slaughtered in California the incidence of *E. debliecki* Douwes (1921) was found to be 30 per cent for animals raised in the State and 82 per cent for animals raised in Nebraska and Kansas. Three additional species of coccidia occurring in swine are described as new under the names *E. spinosa*, *E. scabra*, and *E. perminuta*. Reference is made to the extensive article on coccidiosis in pigs by Biester and Murray published in 1929 (E. S. R., 62, p. 878). A list of 12 other references to the literature is included.

Hypoderma bovis in the horse, A. L. D. TABLIER (*L'Hypoderma bovis chez le Cheval. Thesis, École Natl. Vét. Alfort, 1930, pp. [7]+47*).—The author has

found that the ox warble (*H. bovis*), a common parasite of the bovine, may occasionally occur in the horse, although the conditions there met with are not the most favorable and the larvae of this parasite nearly always die or are eliminated before reaching maturity. Some isolated observations in North Africa furnish exceptions. The account includes a list of 34 references to the literature.

The transmission of periodic ophthalmia of horses by means of filterable agent, A. C. Woods and A. M. Chesney (*Jour. Expt. Med., 52 (1930), No. 4, pp. 637–647, pls. 5.*)—A filtrable agent was obtained from the humors and tissues of the eyes of horses suffering from active periodic ophthalmia, the intravitreous injection of which produced in normal horses the same clinical and pathological picture observed in the natural disease. "This filtrate injected into rabbits produced a different clinical picture, but the essential pathological lesions closely resembled those found in horses. After passage of the filtrable agent through six generations of rabbits, it again produced the clinical and pathological picture of the natural disease when injected into the eyes of normal horses. It appears, in this epidemic at least, that this filtrable agent was the specific etiological factor of the periodic ophthalmia."

Diseases and parasites of poultry, J. S. Buckley, H. Bunyea, and E. B. Cram (*U. S. Dept. Agr., Farmers' Bul. 1652 (1931), pp. II+62, figs. 27*).—A revision which supersedes Farmers' Bulletin 1337, previously noted (E. S. R., 49, p. 885).

Saprophytic and secondary microorganisms occurring in the respiratory tracts of domestic fowls and chickens in health and in disease, C. S. Gibbs (*Jour. Bact., 21 (1931), No. 2, pp. 97–109, figs. 4*).—In studies conducted at the Massachusetts Experiment Station the microbiological flora of the respiratory tract of domestic fowls and chickens was found to be varied in health and in disease. It appears that the number and variety of microorganisms are increased in acute respiratory diseases, and that this increase in microbial flora may be due to the destruction of the ciliated epithelium of the mucous membrane and the increase in secretions and other inflammatory products which are utilized as food by the invader.

While this investigation did not produce sufficient etiological evidence to implicate any of the microorganisms isolated and studied as the primary cause of infectious tracheitis, nevertheless the findings demonstrated *Staphylococcus albus*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, and a new spirochete to be important secondary invaders.

Studies on A-avitaminosis in chickens, I, II, O. Seifried (*Jour. Expt. Med., 52 (1930), No. 4, pp. 519–531, pls. 3; pp. 533–538, pls. 2, figs. 2*).—The first of these two contributions from the Rockefeller Institute for Medical Research deals with lesions of the respiratory tract and their relation to some infectious diseases (pp. 519–531) and the second with lesions of the upper alimentary tract and their relation to some infectious diseases (pp. 533–538).

The principal tissue changes found in the respiratory tract of chickens caused by a vitamin A deficiency in the food were, first, an atrophy and degeneration of the lining mucous membrane epithelium as well as of the epithelium of the mucous membrane glands. "This process is followed or accompanied by a replacement or substitution of the degenerating original epithelium of these parts by a squamous stratified keratinizing epithelium. This newly formed epithelium develops from the primitive columnar epithelium and divides and grows very rapidly. . . . The lesions, which first take place on the surface epithelium and then in the glands, show only minor differences. . . . The specific histological lesions make it possible to differentiate between A-avitaminosis and some infectious diseases of the respiratory tract."

When fowls were placed on a diet lacking in vitamin A, lesions appeared in the upper alimentary tract and were confined largely to the mucous glands and their ducts. "Histologically it is shown that the original epithelium becomes replaced by a stratified squamous keratinizing epithelium, and that secondary infections are relatively common. The ducts of the glands may be blocked, leading to distention with secretions and necrotic materials. These lesions macroscopically resemble very closely certain stages of fowl pox, and the two conditions can be separated only by histological examination. It is pointed out that these lesions produced by a lack of vitamin A may enable bacteria and other viruses to enter the body."

The transmission of pullorum disease (bacillary white diarrhoea) among adult stock, G. H. Warrack and T. Dalling (*Vet. Jour., 87 (1931), No. 667, pp. 24–27*).—Experiments are reported which indicate that the transmission of pullorum disease takes place in adult stock between reactors and nonreactors. It appears that the smaller the space in which the fowls are penned the greater is the chance of such transmission taking place.

A modification of the rapid agglutination reaction, W. J. B. Green and E. M. Robinson (*So. African Jour. Sci., 27 (1930), pp. 487, 488*).—The authors report that the agglutination test of Bunyea, Hall, and Dorset (E. S. R., 62, p. 670) for pullorum infection has proved very satisfactory in South Africa. They have found that a slide smear made from an infected fowl will give a reaction even after a month has elapsed.

The reaction of the fowl to pullorin, L. D. Bushnell and C. A. Brandly (*Jour. Amer. Vet. Med. Assoc., 78 (1931), No. 1, pp. 64–78, figs. 2*).—This is a report of work conducted at the Kansas Experiment Station, the details of which are given in tabular and chart form.

"The very thin skin of the wattle of the fowl precludes the possibility of intradermal injection in many cases with the methods generally employed. The reaction to a single 'intradermal' injection of digest pullorin is manifested by a nonspecific early swelling in infected as well as noninfected fowl, which reaches its maximum size at 3 to 4 hours following injection, and a later specific reaction which attains its maximum size at an average time of 22.5 hours. The character of soft edema with more or less severe swelling as detected by the touch is a more satisfactory criterion for interpretation of the reaction to pullorin than the increase in the thickness of the wattle as measured with the micrometer.

"Macroscopically and microscopically the pullorin reaction resembles the tuberculin reaction as manifested in birds and other species. Frequent repeated tests with digest pullorins do not cause significant desensitization of reactive individuals. The ecto and digest pullorins used in these studies were more satisfactory than other types prepared in our laboratory or those obtained from other sources. In an effort to develop a satisfactory pullorin, sources of variation in the test, including methods of application and standards of interpretation and comparison, must be given major consideration."

The effect of temperature upon the production of hydrogen sulphide by Salmonella pullorum, R. P. Tittsler (*Jour. Bact., 21 (1931), No. 2, pp. 111–118*).—In studies conducted at the Pennsylvania Experiment Station, the details of which are here presented in tabular form, an incubation temperature of 30° C. was found to be the optimum for hydrogen sulfide production by *S. pullorum*. Temperatures above 37° were found to inhibit hydrogen sulfide production. "Slight quantitative differences between aerogenic strains were noted at 30°. The ability to produce hydrogen sulfide was a consistent characteristic. Strains which produced little hydrogen sulfide also produced small

amounts of gas from carbohydrates. Strains which produced no hydrogen sulfide did not produce gas from any carbohydrates. The possibility of a new species is postulated. Difco lead acetate agar is a satisfactory medium with which to show hydrogen sulfide production."

Iodine in the control and treatment of avian coccidiosis, W. R. KERR and G. E. BOTHAM (*Vet. Jour., 87 (1931), No. 667, pp. 10–24, figs. 6*).—Experiments conducted in which iodine in milk was administered in the treatment of avian coccidiosis indicate that this, together with sanitary measures, affords a means of control. Experiments which show the inefficiency of chemical disinfection are reported.

An unusual form of fowl cholera, F. THORP, JR., W. A. JAMES, and R. GRAHAM (*North Amer. Vet., 12 (1931), No. 2, pp. 37–41, figs. 3*).—This is a contribution from Illinois on a sporadic disease of pullets which is characterized by leg weakness, loss of appetite, partial paresis, emaciation, and diarrhea, followed by death. Out of a flock of 250 fowls 75 succumbed. The gross lesions as observed at autopsy in a group of 10 spontaneously infected pullets consisted of abscess of oviduct, suppurative arthritis of coxofemoral articulation, and osteomyelitis of the proximal end of femur with erosion of the articular cartilage. A single pullet failed to show all the lesions enumerated, and none of the pathologic changes were pathognomonic.

"Direct aerobic cultures from the heart blood and liver remained sterile. Three spleens and three kidneys yielded *P[asteurella] avicida*, while either the bone marrow of the femur or tibia in each of the 10 pullets examined yielded *P. avicida*. Animals (rabbits and guinea pigs) injected with a composite emulsion of the bone marrow promptly succumbed to a *P. avicida* bacteremia."

The affection was diagnosed as fowl cholera with Pasteurella localization and abscessation involving oviduct, articulations, and bone marrow of femur and tibia.

The effect of fowl- and pigeon-pox virus vaccination on egg-production, W. T. JOHNSON (*Jour. Amer. Vet. Med. Assoc., 78 (1931), No. 1, pp. 98–101*).—In this contribution from the Oregon Experiment Station details of the egg production of fowls vaccinated with pigeon pox virus as compared with others vaccinated with fowl pox virus are presented in tabular form. The fowl virus caused a decided drop in production, while the pigeon virus permitted a high rate.

Western duck sickness produced experimentally, E. R. KALMBACH (*Science, 72 (1930), No. 1878, pp. 658–660*).—This is a report of work carried on by the U. S. D. A. Bureau of Biological Survey in continuation of that by Wetmore previously noted (E. S. R., 39, p. 460), with material gathered for histological, bacteriological, and pathological studies, a preliminary reference to which by Giltner and Couch is noted below. The symptoms of duck sickness were all accurately and repeatedly reproduced by the feeding of the incubated body tissues of birds that had died of duck sickness after the material had been kept at a temperature of 85° F. for five or more days.

Western duck sickness and botulism, L. T. GILTNER and J. F. COUCH (*Science, 72 (1930), No. 1878, p. 660*).—This contribution from the U. S. D. A. Bureau of Animal Industry refers briefly to a study made of samples of mud and water collected with the assistance of E. R. Kalmbach, of the Bureau of Biological Survey, during the summer of 1930 from an infected area in Tule Lake, Calif., while the outbreak of duck sickness was at its height, as above noted. Bacteriological examination of the mud disclosed the presence of *Clostridium botulinum*, type C. This type was also cultured from the tissues of wild mallards, pintails, and ring-billed gulls that had died or were killed while

afflicted with duck sickness. The clinical picture, coupled with the isolation of botulinum organisms from the mud and the sick birds themselves, suggests that duck sickness is produced by the toxin of *C. botulinum*, type C.

Exudative typhus or avian plague in the Psittaci or parrot-tribe, P. STAZZI, trans. by S. H. FAIRBAIRN (*Vet. Rec., 10 (1930), No. 13, pp. 283–287*).—A brief report on the pathogenicity of the virus and the histological lesions produced in the cockatoo (*Kakatoa rosalba*), studied during the course of a serious epidemic in Italy in 1905.[3]

Salmonella enteritidis infection in guinea pigs and rabbits, R. C. DUTHIE and C. A. MITCHELL (*Jour. Amer. Vet. Med. Assoc., 78 (1931), No. 1, pp. 27–41, figs. 3*).—The authors describe an enzootic form of so-called "pseudotuberculosis" in stock guinea pigs and rabbits caused by a member of the *S. enteritidis* group. Attempts were made to reproduce the disease by feeding and inoculation of pure cultures of a microorganism isolated from about 100 cases of natural infection in guinea pigs and rabbits, the results being tabulated and discussed. It is pointed out that of a total of 856 necropsies made during the year not a single case of natural or spontaneous tuberculosis was found in stock guinea pigs or rabbits, nor did any of the inoculated animals at any time react to the tuberculin test.

The anthelmintic treatment of infestations of the badger with spirurids (Physaloptera sp.), G. H. EHLERS (*Jour. Amer. Vet. Med. Assoc., 78 (1931), No. 1, pp. 79–87*).—A report of work conducted on a badger farm in northeastern Montana, where numerous deaths have been caused by parasites. A report is given of the results obtained with various parasiticides.

AGRICULTURAL ENGINEERING

Land drainage and flood protection, B. A. ETCHEVERRY (*New York and London: McGraw-Hill Book Co., 1931, pp. X+327, figs. 141*).—This work deals with the surface drainage and underdrainage of agricultural lands affected by excessive water due to precipitation or irrigation, the protection of lands against flood and tide waters, and the methods of spreading assessments for the apportionment of the cost of the several classes of improvements to the areas benefited. It emphasizes fundamental theories and principles of design, and has been planned to be useful to engineers interested in land drainage and the protection of overflow lands, also to trustees, directors, or other officials of reclamation and drainage districts and to commissioners of assessment.

The first eight chapters deal mainly with the surface and underdrainage of lands in which the need for drainage results from excessive precipitation or lack of natural drainage. In this connection emphasis is placed on soil formation, soil texture, and soil water and their relation to drainage; the theory and principles of soil drainage; the relation of surface drainage to underdrainage and the fact that artificial drainage is supplemental to natural drainage; the design of open drainage and underdrainage systems; drainage of lands with variable conditions of soils and subsoils, as well as that of lands with uniform soil texture and structure; and the construction and maintenance of tile drain systems. The remaining chapters deal with drainage of water-logged irrigated lands, protection of lands from flood waters, problems in the computation of flow in river channels, reclamation of tidal lands, and drainage and reclamation districts.

A further memorandum on the draining of hilly lands with a view to reducing soil erosion, E. O. FELSINGER (*Trop. Agr. [Ceylon], 74 (1930), No. 2,*

[3] Clin. Vet. [Milan], 29 (1906), pp. 337–344, 364–370.

pp. 68–70, pls. 6).—Methods of draining and terracing hill lands, planted to rubber, to prevent erosion are described and diagrammatically illustrated.

Torrential floods in northern Utah, 1930 (*Utah Sta. Circ. 92* (*1931*), *pp. 51, figs. 24*).—This is the report of a special flood commission appointed by the Governor of Utah to study the origin, cause, and prevention of floods in Davis County. Part 1 deals with ways and means, part 2 with flood control works, and part 3 with causes and prevention of floods.

Evidence was observed on the watersheds of Davis County to show that, had the plant cover been approximately equal to its original natural condition, the flooding in that section from the rains of 1930 would have been far less serious, if not prevented.

The commission recommended the construction of barriers and settling basins at the mouths of the flooded canyons as the best means to control the high water and the débris it will otherwise deposit on valuable property during the spring run-off period and summer freshets, and, in so far as possible, to control floods similar to those of 1930 pending the restoration of normal conditions on the watersheds. Rehabilitation and maintenance of the plant cover on the depleted parts of watersheds is deemed necessary for the abatement or prevention of floods.

Data also are included on the geology of the area.

Engineers seek best terrace plans, R. W. Baird and H. J. Harper (*Oklahoma Sta. Rpt. 1927–1930, pp. 280–282, figs. 2*).—The progress results of terracing studies on 13 areas are reported which indicate that terrace ridges can be constructed cheaper with a crawler type of tractor and grader than when a wheel tractor is used.

The percentage of run-off did not vary appreciably when a 2-, 3-, or 4-ft. vertical interval was used between terrace ridges. The rate of rainfall and moisture content of the soil affect the percentage of run-off for a given rain. Variations from less than 20 to more than 65 per cent have occurred from similar heavy rains.

The amount of run-off water increased with the fall, or gradient, of the terrace ridge, and where the gradient exceeded 4 in. per 100 ft., considerable quantities of sand were carried along the causeway by the run-off water. The total sediment carried away in run-off water from the area bounded by a terrace ridge having a gradient of 4 in. per 100 ft. was less than 2 tons of soil per acre per year. This rate of erosion was less than 5 per cent as rapid as that which occurred on an adjacent area of unterraced land.

The temporary ground water level was usually higher on the terraced land than on unterraced land during the spring months when the rainfall is greater than at other periods during the year.

Measuring irrigation deliveries in the Panjab, E. S. Lindley (*Amer. Soc. Civ. Engin. Proc., 57* (*1931*), *No. 2, pp. 269–283, figs. 3*).—The paper describes the conditions of Indian canals as affecting the problem of distributing the supplies received in the manner desired. It describes the devices available for effecting such distribution with a minimum of manual control, mentions their principal qualities, and refers to the records of investigations directed to their improvement. An outline is given of the theories on which to base design in using such devices to form a complete scheme of automatic distribution, and, finally, their practical application is discussed in so far as they are found possible under present limitations of knowledge and invention.

The method and means of measuring and apportioning irrigation deliveries that are in course of development in India, and especially in the Punjab, are described.

Flow in silt-laden canal gaged by contracted flume, R. L. Parshall (*Engin. News-Rec., 106 (1931), No. 5, pp. 183–185, figs. 3*).—In a contribution from the Colorado Experiment Station and the U. S. D. A. Bureau of Public Roads, a description is given of a large Venturi flume installation in the Fort Lyon irrigation canal near La Junta, Colo., which has a capacity of about 1,800 sec.-ft. and serves an area of 96,000 acres. Comparison of observed and computed discharges for flows from 128 to 1,464 sec.-ft. showed a maximum deviation of 2.3 per cent.

Resistance of concrete and concrete pipes to corrosion by water [trans. title], B. V. Frost and E. J. Virgin (*Statens Provningsanst., Stockholm, Meddel. 48 (1929), pp. 64, figs. 16; Eng. abs., pp. 62–64*).—Laboratory tests using the percolation method are reported, with special reference to the influence of carbon dioxide in the water on concrete of different mixtures.

It was found that pure water has a relatively great dissolving power, while waters containing bicarbonates of lime and magnesia (temporary hardness) are less aggressive. If the surface of the cement has been previously carbonated this diminishes the release of lime, especially in the case of water with no or only a low temporary hardness. The existence of aggressive carbonic acid, which is common in subsoil water in Sweden, enhances the dissolving power of the water, and a content of from 30 to 50 mg. per liter is considered dangerous to unprotected concrete. If the water only affects the surface of the concrete, and the latter is so tight as to prevent water from entering it, the attack of the water is as a rule very slow; and for practical purposes a perfectly tight concrete has a good and sufficient durability in ordinary river and lake water and subsoil waters that are not too aggressive. Carbonation of the concrete surface in the open air with repeated damping with water increases, as a rule, its endurance against the action of water.

Simple test for impurities in sand to be used for concrete on the farm, D. G. Miller and P. W. Manson (*Minn. Univ. Agr. Ext. Circ. 34 (1930), pp. 4, fig. 1*).—This test is described briefly. It consists essentially of observing the dissolution of organic impurities in the sand in a solution of lye as an indication of the amount of such impurities present.

Investigation of the effect of phosphorus in wrought iron, J. H. Higgins (*Amer. Soc. Testing Materials Proc., 30 (1930), pt. 1, pp. 170–184, figs. 6*).—The results of an extensive series of tests of the effect of phosphorus in wrought iron are reported. These indicate that tensile strength and yield point are increased, and that the elongation and reduction of area are decreased, with an increase in the phosphorus content. The vibratory tests also show an increase in vibrations before failure as the phosphorus increases.

Notes on strength of timbers, with list of transverse tests on specimens in the Technological Museum, M. B. Welch (*Technol. Mus., Sydney, Bul. 13 (1929), pp. 21*).—Information is given on various factors affecting the strength of timbers, and data on the physical and mechanical properties of different woods are included.

Public Roads, [January, 1931] (*U. S. Dept. Agr., Public Roads, 11 (1931), No. 11, pp. 209–236+[2], figs. 29*).—This number of this periodical contains the status of Federal-aid road construction as of December 31, 1930, together with the following articles: A Study of Methods of Curing Concrete Pavements, by F. H. Jackson and E. W. Bauman (pp. 209–234); and Recent Publications of the American Society for Testing Materials (pp. 235, 236).

Agricultural power handbook (*[San Francisco]: Pacific Coast Elect. Assoc., 1929, pp. 62, figs. 35*).—This handbook attempts to cover the major uses of electricity in the agriculture of the Pacific coast region.

Power and heat in agriculture and in agricultural industrial management, W. Leder (*Kraft und Wärme in der Landwirtschaft und in Landwirtschaftlich-Industriellen Betrieben. Dresden and Leipzig: Theodor Steinkopff, 1930, pp. X+222, figs. 145*).—This book contains chapters on fundamental principles of power and heat and their technical application, power and heat in the dairy, drying and processing of agricultural products, power and heat utilization in ceramics, peat development, and fuel manufacture.

Heat power, E. B. Norris and E. Therkelsen (*New York and London: McGraw-Hill Book Co., 1930, pp. XIII+376, figs. 257*).—This book deals with the principles of heat power. It contains chapters on the internal-combustion engine, internal-combustion engine details, fuels for internal-combustion engines, principles of combustion, work and power, heat and work, analysis of internal-combustion engine cycles, actual performance of internal-combustion engines, the steam power plant, steam, steam engine performance, improving steam engine performance, steam engine mechanisms, the steam turbine, condensing equipment, steam boilers, boiler fuels and furnaces, boiler accessories and auxiliaries, and boiler performance.

Farm and industrial tractors, D. N. McHardy (*London: Crosby Lockwood & Son, 1930, pp. [XVI]+244, figs. 78*).—This is a handbook of information on tractor operation, care, and use for both farming and industry from the English viewpoint. It contains chapters on early development, British tractor trials, the internal-combustion engine, valve operation, fuels and carburetion, ignition, lubrication, cooling systems, transmission systems, chassis design and running gear, crude oil engines, driving, maintenance, possible sources of trouble, the organization of farm work, plowing, tillage work, drilling, haying and harvesting, belt work, farm haulage, costs of operation, the horticultural tractor, industrial types, trailers and equipment, and some industrial applications.

Plows and plowing, J. M. Smith (*Alberta Univ., Col. Agr. Bul. 6, 4. ed., rev. (1930), pp. 42+[3], pls. 5, figs. 23*).—This is the fourth revised edition of this bulletin (E. S. R., 56, p. 282). It contains practical information on the adjustment and operation of plows.

Stationary spray systems in West Virginia, F. D. Cornell, jr. (*West Virginia Sta. Bul. 239 (1931), pp. 28, figs. 9*).—This bulletin reports the results of a study of the details and costs of installation and operation of stationary spraying systems, and of the economy and efficiency of these systems as compared with portable systems in both large and small orchards.

The results point to the necessity of a plentiful water supply and a power unit large enough to maintain proper pressure with some reserve. Copper bearing pipe has certain advantages for use in such a system. Main lines may vary in size from 1 to 2 in., while laterals should not be less than 0.75 in. An air chamber of sufficient size in the line is indispensable. Globe valves and special cut-offs are preferred to gate valves. Provision for drainage should be made at all low points in the line to prevent difficulties resulting from freezing. High-pressure hose with a minimum of 0.5 in. in size is recommended for stationary outfits.

The trend in development is toward the use of more pipe and fittings, less hose, and a 1-man unit. The economy of this plan has been demonstrated. It eliminates delays in the field occasioned through the use of long hose, decreases labor costs and the difficulty of obtaining reliable help, decreases the possibility of missing trees in spraying, and speeds up the spraying operation. The stationary spray system possesses an advantage in the number of trees it is possible to spray per man hour, as compared with portable sprayers, particularly on systems where a 1-man unit is used.

Stationary spray plants are adaptable to every type of topography and are in use now in orchards where portable sprayers could be used only with the greatest difficulty.

The initial cost of the stationary system for orchards of commercial size need be no greater than the cost of complete portable spray equipment for the same orchard.

Plans for a simple milk house, H. E. Ross (*N. Y. Agr. Col. (Cornell) Ext. Bul. 200 (1930), pp. 19, figs. 6*).—Plans for and a description of a simple milk house are presented, together with a bill of materials.

Ventilation of the Cornell open-front poultry house, F. L. Fairbanks and H. E. Botsford (*N. Y. Agr. Col. (Cornell) Ext. Bul. 197 (1930), pp. 12, figs. 11*).—Practical information is presented on the ventilation and management of the Cornell open-front poultry house.

A reinforced concrete reservoir, E. J. van Meerten (*Union So. Africa Dept. Agr. Bul. 66 (1929), pp. 15, figs. 10*).—Brief information is given on the design and construction of a reinforced concrete reservoir for farm water supplies in the Union of South Africa.

Reinforced brick reservoirs, E. J. van Meerten (*Union So. Africa Dept. Agr. Bul. 79 (1929), pp. 43, figs. 28*).—Detailed information is given on the design and construction of reinforced brick reservoirs for farm water supplies in the Union of South Africa.

A system for the bacteriological examination of water, A. J. Salle (*Jour. Bact., 20 (1930), No. 6, pp. 381–406, fig. 1*).—In a contribution from the University of California and the Bureau of Sanitary Engineering of the California Department of Public Health, the results of comparative tests are reported, using *B. coli*, *B. aerogenes*, *B. subtilis*, *Staphylococcus aureus*, and *S. albus*. These have shown the superiority of crystal violet over brilliant green as a bacteriostatic agent.

A crystal violet broth medium for the presumptive test is described, containing peptone (Difco) 15 gm., K_2HPO_4 15 gm., KH_2PO_4 3 gm., lactose 15 gm., crystal violet (1 : 5,000 solution) 21.5 cc., and distilled water to make 2,000 cc. Production of acid and gas in this medium in practically 100 per cent of the samples examined is due to members of the coli-aerogenes group. An agar-dye differential medium, containing peptone 10 gm., K_2HPO_4 3 gm., KH_2PO_4 0.6 gm., lactose 5 gm., agar 20 gm., distilled water 1,000 cc., erythrosine (2 per cent aqueous) 20 cc., methylene blue (1 per cent aqueous) 20 cc., and bromcresol purple (1 per cent alcoholic) 2 cc., is described.

Results on this medium are equivalent to a partially confirmed and a confirmed test. In other words, two tests are obtained in one operation, thus shortening the period to complete an analysis by 24 hours. *B. coli* and *B. aerogenes* are sharply differentiated because of distinct differences in their carbohydrate metabolism. Results of water examinations are detailed, showing the superiority of the method over the standard method.

A list of 86 references is included.

The automatic underfeed coal stoker for domestic heating, H. J. Dana (*Wash. State Col., Engin. Expt. Sta., Engin. Bul. 27 (1929), pp. 19, figs. 6*).—This equipment is briefly described and diagrammatically illustrated, and the results of service tests are reported. They indicate that, by installing an automatic underfeed coal stoker, the coal will be burned much more efficiently and therefore a smaller amount of coal should be consumed during the season. Actually the added ease and convenience of heating a residence with a stoker serves to induce the owner to maintain himself more comfortably and for a greater part of the 24 hours, with the result that he will probably burn about the same

number of tons of coal as by the usual hand-firing methods. The grade of coal used in the stoker, however, costs from 30 to 40 per cent less than lump coal for hand firing.

Refrigeration as applied to the transportation and storage of food products, E. W. SHANAHAN (*London: Gee & Co., [1929], pp. X+96, figs. 4*).—This book deals with the technical and practical phases of refrigeration. It contains chapters on refrigeration as a factor in the food supplies of great cities and densely populated areas, the genesis and growth of refrigeration, the volume and the nature of refrigerated traffic, the technical basis of mechanical refrigeration, insulation and insulating materials—design of cold stores and refrigerated rolling stock, the treatment of produce under refrigeration, defectiveness of final links in cold storage chains, and refrigeration in relation to present and future food supply services.

RURAL ECONOMICS AND SOCIOLOGY

Some evidences of agricultural progress, H. W. MUMFORD (*Illinois Sta. Circ. 365 (1931), pp. 20*).—This is an address delivered at Farm and Home Week at the University of Illinois, January 15, 1931, in which the increased efficiency on individual farms, progress in educational opportunities, improved marketing facilities, progress in agricultural credit and finance, organization among farmers, and the changed attitude toward farm problems are briefly discussed.

Agricultural outlook for Illinois, 1931 (*Illinois Sta. Circ. 366 (1931), pp. [2]+24, fig. 1*).—This circular presents facts bearing upon the current agricultural situation and points out the trends in supply and demand for the leading agricultural products of the State.

[Surveys of agricultural and grazing possibilities in Alaska], H. W. ALBERTS (*Alaska Stas. Rpt. 1929, pp. 38–46, figs. 3*).—Surveys were made in 1929 of the possibilities for grazing in the vicinity of Dunbar and on Kodiak Island for agriculture, including fox raising in the Kusilof River Valley, and the dairy situation in the Territory.

Types of farming in Michigan, E. B. HILL, F. T. RIDDELL, and F. F. ELLIOTT (*Michigan Sta. Spec. Bul. 206 (1930), pp. 83, pls. 2, figs. 26*).—This bulletin, prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A., describes the physical, economic, biological, and personal factors determining the crop and livestock enterprises in Michigan. It includes maps showing, by counties, the land utilization, acreages in different crops, and the numbers of different kinds of livestock, as shown by the 1925 Federal agricultural census, and tables showing the average acreage, production, and farm value of different crops and kinds of livestock and livestock products for the period, 1924–1928.

The State is divided into 14 type-of-farming areas, and tables are presented and discussed showing for each area the average yields, 1918–1927, of different crops and the distribution of crops and livestock, by counties, for 1910, 1920, and 1925. Typical farming systems for different size farms in the different areas and the ways such typical systems may be used are described.

An economic analysis of production problems on the Flathead irrigation project, S. E. JOHNSON (*Montana Sta. Bul. 237 (1930), pp. 88, figs. 33*).—Detailed farm accounts kept on successful farms of different types, and data regarding weather, crops, livestock, irrigation, etc., from the annual farm censuses on the project are analyzed. The soil, topographical and climatic conditions, agricultural development, and present utilization of resources are described. Suggestions are made for a development policy to assure higher incomes. Business organizations are outlined for 80-, 160-, and 240-acre farms,

using dairying as the principal enterprise, and combining dairying, hogs, and sheep, and sugar beets and dairying. Illustrations from accounts kept on actual farms in 1927 and 1928 are included.

A five-year economic study of 125 farms in Curry and Roosevelt Counties, New Mexico, L. H. Hauter, A. L. Walker, and O. V. Wells (*New Mexico Sta. Bul. 186 (1930), pp. 70, figs. 15*).—This bulletin is the first of a series on the economics of agriculture on dry-land farms in eastern New Mexico. It is based on data from 125 farms, from which usable records were secured for each of the 5 years. The work in 1924 was done in cooperation with the U. S. Department of Agriculture and the extension service of the New Mexico College of Agriculture and Mechanic Arts, and has been previously noted (E. S. R., 58, p. 489).

The agricultural development, climatic and physical characteristics of the area, and the trends in crop and livestock production are described. Tables are included and discussed showing the use of land, capital invested, farm business summaries, variation in labor income, and farm indebtedness by source of loans. The relation is discussed between type of farming and size of business in terms of productive man labor requirements, labor income, and efficiency of labor utilization; between labor income and crop yields and livestock credits; between labor efficiency and labor income; between farm organization and labor income; and between increase in net worth and time of settlement and type of farm.

The average capitalization of the farms was $12,663, of which slightly less than 80 per cent was in real estate. The farmers had an 83 per cent equity in their business. Receipts from crops averaged $1,162 per year and from livestock and livestock products $1,300, of which $347 was from sale of cattle, $365 from dairy products, and $301 from poultry and eggs. An average of 18.6 months of man labor was used per farm. The average farm income was $1,144, and the average labor income $385. Allowing $560 for operators' wages, 4.6 per cent was earned on the capital invested. The average income available for family living and savings was $1,157.

Of the 125 farmers, the labor incomes of 49 averaged from $1 to $500, of 24 from $501 to $1,000, of 18 from $1,001 to $3,642, and those of 34 were negative.

Farms with a considerable acreage of wheat had higher average labor incomes than those confined to row crops, but the incomes varied greatly from year to year. Farmers with more than average receipts from dairy and poultry products made labor incomes from $500 to $1,000 greater and used their labor 25 per cent more completely than did those whose receipts from such sources were less than the average. Farmers specializing in wheat production used labor 47 per cent completely, diversified crop farmers 73 per cent, and row crop farmers 68 per cent. The average increase in net worth since settlement exceeded $4,500 per farm, being highest for the diversified farming group with a considerable acreage of wheat and more than the average receipts from dairy and poultry products.

Production requirements, costs, and returns from dry-land farming in eastern New Mexico, L. H. Hauter, A. L. Walker, and O. V. Wells (*New Mexico Sta. Bul. 187 (1930), pp. 59, figs. 21*).—This is the second of the series noted above. Tables and charts are included and discussed showing the man labor and horse and tractor requirements, by months, and the costs of such labor requirements, and the costs for material, seed, taxes, interest, etc., in producing wheat, grain sorghum, corn, Sudan grass seed, broomcorn, cotton, butterfat, eggs, and beef cattle. The production requirements and cost data

are based on the most usual method or that most likely to prevail in the near future. The market and price outlook for the several products is discussed. Tables are also given showing the costs and returns with different yields and prices, and the method of applying the data to a specific farm is explained.

[Investigations in agricultural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul. 148 (1931), pp. 28–32*).—Results are reported as follows:

Tenant operators who are owners-in-prospect, E. D. Tetreau (pp. 28, 29).—Of 610 farmers visited in Madison and Union Counties in 1928, 340 were owners and 270 tenants, of whom 17.8 per cent operated farms they expected to inherit. The percentages of owners-in-prospect tenants were 7.3 in high tenancy areas, 18.9 in medium tenancy areas, and 41.2 in low tenancy areas.

Farm business summaries for 1927, 1928, and 1929, J. I. Falconer (pp. 29–31).—A table is given showing in different counties the average cash receipts, cash expenses, and labor income on groups of farms with different enterprises.

Index numbers of production, prices, and income, J. I. Falconer (p. 32).—The table previously noted (E. S. R., 64, p. 184) is brought down through October, 1930.

[Investigations in agricultural economics at the Oklahoma Station, 1926–1930] (*Oklahoma Sta. Rpt. 1927–1930, pp. 186–211, figs. 3*).—Investigations not previously noted are reported on as follows:

[*Mobility of Oklahoma farmers*], J. T. Sanders (pp. 186–188).—The percentages of farmers operating their farms for the first time in 1924 were for full owners 9.8, part owners 7.8, cash tenants 44.6, croppers 68.8, other tenants 48.8, and all farmers 33.6. The percentages varied greatly in the several crop reporting districts of the State, being 14 per cent for all farmers in the northwestern part of the State and 43.1 per cent in the southeastern part. Approximately 36.5 per cent of all farm children under 10 years of age were involved in the moves. Children of farmers who moved least frequently averaged about 20 per cent more progress in school per year than did those of the farmers who moved most frequently.

[*Credit problems of cotton farmers*], J. T. Sanders and A. N. Moore (pp. 189–192).—Interviews with 148 owner and 301 tenant farmers in Garvin, Jackson, and Pittsburg Counties showed that 65 per cent of the owners and 86 per cent of the tenants used short-term credit. More than 25 per cent of the credit was extended by local stores. The rates of interest averaged 11.3 per cent for cash loans and 32.5 per cent for merchant credit, as compared with about 7 per cent for farm mortgage loans. Of the credit used by the owners, 24 per cent was used for living expenses, 42 for farm operating expenses, 23 to purchase land, and 11 per cent for payment of debts. The percentages for tenants were 69, 19, 0, and 13, respectively.

The world cotton situation, with outlook for 1931–32 and the long-time outlook for southern agriculture (*U. S. Dept. Agr., Misc. Pub. 104 (1930), pp. 76, figs. 45*).—Charts are presented and discussed showing for periods of years the total domestic and foreign demands; the demands in different countries or groups of countries in Europe and Asia; the world supply and the supply in the United States, India, China, Egypt, and Russia; prices, staple length, production, distribution, and carry-over of American cotton; the domestic consumption of long-staple cottons; staple length of foreign cotton; indexes of cost factors in cotton production in the United States; the costs of producion in different cotton areas of the United States; and the cotton acreage reduction, 1926 to 1927, in different States of the United States.

The outlook for cotton in 1931–32, and the long-time outlook for agriculture in the Southern States of the United States are also discussed.

Wheat, E. W. Braun (*California Sta. Bul. 502 (1930), pp. 34, figs. 10*).—The acreage and its distribution, yields, and production of wheat in California, types of wheat grown in that State and other Western States, the sources of California's wheat and flour supplies and the disposition of its wheat supply, the factors affecting the world price of wheat, the price in San Francisco and its relation to Portland, Liverpool, and eastern terminal prices, exports of wheat from the Pacific Northwest, trend in world wheat production, and the international trade in wheat are discussed.

California wheat production decreased from about 40,000,000 bu. in 1890 to 4,200,000 in 1913 and then increased to an average of 13,570,000 bu. per year during the period 1926–1929. During the same period California imported an average per year of 16,220,000 bu. of wheat as grain and flour, of which 5,127,000 bu. was grain. Approximately 50 per cent of the imports were from the Pacific Northwest and 37 per cent from Idaho. Approximately 1 per cent of the production of the State and imports were exported as grain and 5 per cent as flour.

California wheat prices tend to fluctuate with the prices in the eastern markets of the United States, and the year-to-year changes are closely related to the changes in the Portland, Liverpool, and London prices, averaging for the period 1921–1929 10 cts. per bushel above the Portland price and 16 cts. below the Liverpool and London prices. The future prices in California are largely dependent on the trend of production in Europe with its consequent effect on world wheat prices.

The rural tax situation in Choctaw County, Miss., L. E. Long (*Mississippi Sta. Bul. 282 (1930), pp. 70, figs. 19*).—The trend of taxes, 1917–1928, relation of taxes to ability to pay and of assessed values to sale values, tax delinquency, and the receipts and expenditures of the county are discussed and remedies for the rural tax situation suggested.

From 1917 to 1928 the State tax rate increased from 4 to 8 mills and the county rate from 12.75 to 70 mills, the increases from 1927 to 1928 being 2 and 31 mills, respectively. Taxes per acre of rural lands increased from 7.44 cts. in 1917 to 30.44 cts. in 1928. On 114 farms in 1928, assessed values averaged 44.8 per cent of estimated values for land, 30.1 per cent for improvements, and 13.7 per cent for timber. The percentages for land ranged from 38.9 for the farms of 61 to 140 acres to 72.8 for farms of 221 to 300 acres. Delinquency was low, there being only 91 persons out of 3,898 assessed for rural real estate delinquency.

Of the total receipts of the county for the year ended June 30, 1928, 65.55 per cent were revenue receipts, including 32.15 per cent from the general property taxes, 4.59 per cent from the gasoline tax, 3.81 per cent from the privilege tax, and 20.93 per cent from State appropriations. Temporary loans comprised 31.73 per cent and bonds 2.31 per cent. Of the expenditures, 9.56 per cent was for interest, 0.78 per cent for charity and miscellaneous, 21.88 for education, 25.4 per cent for highway maintenance, and 2.48 per cent for administration. The nongovernmental costs comprised 38.64 per cent, permanent improvements being 30 per cent, bonds 3.22 per cent, and temporary loans 5.42 per cent.

Summary of irrigation-district statutes of Western States, W. A. Hutchins (*U. S. Dept. Agr., Misc. Pub. 103 (1931), pp. 127*).—This publication, prepared in cooperation with the California State Department of Public Works, summarizes the provisions of the statutes of the several States of the United States bearing on the different phases of organization, bonding, management and operation, taxes, dissolution, etc., of irrigation districts.

Organization and management of agricultural credit corporations in Arkansas, B. M. Gile (*Arkansas Sta. Bul. 259 (1931), pp. 55, figs. 4*).—From

1924 to July, 1930, 26 agricultural credit corporations and 2 livestock credit corporations were organized in Arkansas. Of the 22 organized prior to 1930 for making crop production loans, 15 have discontinued operations after an average existence of about 3 years. The location, reasons for organizing and liquidating, plans of organization and operation, purpose of loans, cost of credit to the corporations and to farmers, volume of business done, number and types of borrowers, basis for loans, size of individual loans, financial status of owner and tenant borrowers, and the problem of financing such corporations are discussed, the data being obtained from the records of the corporations, by interviews and correspondence with officers of active and discontinued corporations and with officers of the Federal Intermediate Credit Bank of St. Louis, and from reports of the Federal Farm Loan Board.

During the 7-year period the crop production loans totaled $6,015,498 and livestock loans $60,246. The cost of credit to farmers—interest and fees for inspection—varied from 7.73 to 11.21 per cent in the 7 agricultural credit corporations making loans in 1929. The security required, terms of payment, and purposes of loans were approximately the same as those of commercial banks, the loaning basis of $7 per acre for cotton and $3 per acre for feed crops working exceedingly well. The high liquidation rate among the corporations was traceable largely to the absence of ownership interest on the part of patrons—no corporation organized prior to 1930 having survived where farmers did not contribute to the capital stock—and to the low gross income available for operation. The experience in 1928 and 1929 indicated that a margin between income received and interest charged farmers of at least 2.4 per cent of the annual volume of loans is necessary.

The conclusion is reached that while such corporations have fulfilled a distinct need as emergency institutions, their future for other than emergency needs is uncertain under present regulations and conditions. Two suggestions are made for changes that (1) the regulation of the Federal Farm Loan Board requiring a minimum of $10,000 capital stock in order to discount with an intermediate credit bank be reduced, and (2) a national system of connecting institutions comparable to national farm loan associations be provided for to reduce organization expense and make possible uniformity in type of organization, elasticity in capital stock required, and better supervision.

Prices of Illinois farm products in 1930, L. J. NORTON (*Illinois Sta. Bul. 365 (1931), pp. 21–32, figs. 3*).—Comparisons are made of the 1930 prices of 21 leading agricultural products with the average prices for the periods 1910–1914 and 1921–1929. For the whole year 1930 only the prices of apples, veal calves, potatoes, milch cows, and beef cattle were higher (2 to 14 per cent) than the averages for the same months, 1921–1929. Hogs and corn were 1 per cent lower and the other products 7 to 29 per cent lower. During the second half of the year only beef cattle and apples were equal to the 1921–1929 averages, the other 19 products being from 2 to 40 per cent lower. The indexes (1910–1914=100) of the 1930 prices were for apples 169.2, barley 79.4, beef cattle 150.3, butter 148, chickens 163.6, red clover seed 123.8, corn 125.9, eggs 114.3, hay 79.1, hogs 123.1, horses 52.8, lambs 151.9, milch cows 147.6, oats 92.1, potatoes 178.3, rye 87.7, sheep 115.2, veal calves 150, wheat 95.6, and wool 115.

The changes in prices of sheep products, cattle, and eggs are largely cyclical, those of wheat fairly permanent, and those of corn and hogs are due largely to the relatively small corn crop in 1929 and the very short corn crop in 1930.

Farm prices of cotton related to quality: Georgia crop, 1928–29, L. D. HOWELL and W. T. FULLILOVE (*Georgia Sta. Bul. 165 (1930), pp. 33, figs. 6*).—Ten representative local markets widely distributed over the State were studied during the crop season 1928–29 in cooperation with the U. S. D. A. Bureau of

Agricultural Economics. Samples from 10,779 bales were classified as to grade and staple, and so far as possible data were obtained as to the price received, date of sale by growers, and buyers' classification.

Tables and charts are included showing the number of sales and percentage of crop tenderable and untenderable on contracts, 1927, 1928, and 1929; grade and staple length of samples taken in 1928–29; variations in prices paid in 4 markets on October 6, 1928; average grade differences of prices paid in local and central markets and in the New York futures market and in different types of local markets; and the average yield, percentage of lint, and relative value of different staple lengths grown in Georgia.

Of the bales sampled, 76 per cent graded white, 6.8 per cent $\frac{13}{16}$-in. and shorter staple, 75.3 per cent $\frac{7}{8}$-in. staple, 15.6 per cent $\frac{15}{16}$-in. staple, 1.9 per cent 1- and $1\frac{1}{32}$-in. staple, 0.3 per cent $1\frac{1}{16}$ and $1\frac{3}{32}$-in. staple, and 0.1 per cent $1\frac{1}{8}$- and $1\frac{5}{32}$-in. staple. The prices paid growers for cotton of the same grade and staple on October 6, 1928, varied as much as 65 cts. on one market, $5.60 on the second, $12.50 on the third, and $20 on the fourth market per 500-lb. bale.

On one of the markets the price of low middling $\frac{7}{8}$-in. cotton varied from $5.65 per bale below to $13.75 per bale above that paid for strict good ordinary $\frac{13}{16}$-in. and shorter staple; on the second the variation was $5 per bale below to $25 above for good ordinary $\frac{13}{16}$-in. and shorter; on the third market middling $\frac{7}{8}$-in. cotton sold for $5.60 below to $5 above strict low middling $\frac{7}{8}$-in. cotton; and on the fourth good middling $\frac{15}{16}$-in cotton varied from the same as low middling $\frac{7}{8}$-in. staple to 65 cts. below. Similar variations were found in the prices paid for different grades and staple lengths.

Weighted averages for the 10 markets studied showed the following average premiums and discounts for white cotton from the price per bale of middling grade: Strict middling +85 cts., good middling +$1.20, strict good middling +$1.15, strict low middling —$1, strict good ordinary —$3.45, and good ordinary —$5.25. The average premiums for staple lengths compared with $\frac{7}{8}$-in. staple of the same grade were for $\frac{15}{16}$-in. 25 cts., 1- to $1\frac{1}{32}$-in. $1.25, $1\frac{1}{16}$- to $1\frac{3}{32}$-in. $2.05, and $1\frac{1}{8}$- to $1\frac{5}{32}$-in. $4.35. The average discount for $\frac{13}{16}$-in. staple and shorter was only 10 cts. The average proportions of central market premiums actually received by growers were for strict middling 65.4 per cent, good middling 60 per cent, and strict good middling 38.3 per cent. Of the discounts, the proportions taken from growers were for strict low middling 28.6, low middling 29.2, strict good ordinary 30.8 and good ordinary 34.2 per cent. The average staple premiums and discounts in central markets received by growers were for $\frac{13}{16}$-in. and shorter staple 0.04 per cent discount, $\frac{15}{16}$-in 18.5 per cent premium, 1- to $1\frac{1}{32}$-in. 30.9 per cent premium above the price paid for 1-in. cotton, $1\frac{1}{16}$- to $1\frac{3}{32}$-in. 25.9 per cent of the price paid for $1\frac{1}{16}$-in cotton, and $1\frac{1}{8}$- to $1\frac{5}{32}$-in. 40.3 per cent of that paid for $1\frac{1}{8}$-in cotton.

The spread between local and central market prices for $\frac{7}{8}$-in. white staple widened from 29 points in August, 1928, to 47 points in September, narrowed to 29 points in October, and then increased to 106 points in February, 1929, and was 89 and 61 points, respectively, in March and April, 1929. The spread between local market and New York futures prices increased from 68 points in August, 1928, to 110 points in September, and to 217 points in February, 1929, then narrowed to 146 and 147 points, respectively, in March and April.

The study showed that individual Georgia farmers are penalized for producing the higher grades and longer staples and are paid a bonus for producing the lower grades and shorter staples, but that average prices are higher in communities producing the higher grades and longer staples. Suggestions for improvements are to perfect the marketing system so that it will reflect to growers the differences in spinning quality of the different grades and staple

lengths, to advise as to relative profitableness of producing different grades and staple lengths, and to provide for accurate classification according to uniform standards and the issuance of classification certificates.

Wheat futures (*U. S. Dept. Agr., Statis. Bul. 31 (1930), pp. 212, figs. 9*).—Statistics are included on the volume of trading, open commitments, and prices from January 3, 1921, to December 31, 1929. The open commitment figures and those on trading subsequent to July 9, 1923, were compiled solely from reports to the Grain Futures Administration of the Department. Internal revenue reports were virtually the sole source for data on trading from January 3, 1921, to April 30, 1923. For the period May 1, 1923, to July 9, 1923, the internal revenue reports and reports to the Grain Futures Administration were used. The bulletin relates largely to trading in the principal futures on the Chicago Board of Trade, as from 81 to 88 per cent of the trading in wheat futures in the United States is done on that market.

The tables and charts included show the annual volume, by calendar and crop years, and the monthly volume, total and by futures, of trading in all wheat futures combined on each of the 10 leading markets of the United States; for the Chicago Board of Trade the annual and monthly volume of trading in the principal futures, the average daily volume of trading, volume of open commitments, and maximum and minimum commitments in all futures and in each of the principal futures, and the highest and lowest prices, seasonal range, and monthly and daily prices for each of the principal futures; and in the Minneapolis and Kansas City markets the open commitments in the May, July, September, and December wheat futures at the end of each week, August 4, 1923, to December 31, 1929.

Marketing California apples, E. A. STOKDYK, H. E. ERDMAN, C. H. WEST, and F. W. ALLEN (*California Sta. Bul. 501 (1930), pp. 151, figs. 20*).—This study of the methods of marketing apples, market preferences, and of the possibilities for improvement in marketing was made by the division of pomology and the Giannini Foundation of Agricultural Economics. Opinions on market preferences were obtained by personal interviews from 104 retailers and 37 shippers in California and 116 wholesalers and jobbers and 34 brokers and distributors in California and eastern cities; on consumers' preferences and purchases from 649 consumers in Los Angeles, San Francisco, Oakland, and Berkeley; on their operations and practices from 104 retailers in California cities; on shippers' operations and practices from 37 shippers in the Sebastopol, Watsonville, and other districts in California; on credit from confidential reports from 188 growers; and from weekly retail price reports from farm advisors, horticultural commissioners, agricultural high school teachers, secretaries of chambers of commerce, and others.

The trade channels followed by California apples; the variety, size, grade, pack, container, and color preferences of the trade; the demand for immature apples and the effect of sales of such apples; consumers' preferences and purchases; retailers', wholesalers', jobbers', brokers', distributors', and shippers' operations and practices; the financing and marketing problems of growers; storage; apple supplies; and wholesale and retail prices are discussed.

A cooperative marketing manual, J. G. KNAPP (*North Carolina Sta. Bul. 276 (1930), pp. 80*).—This manual, prepared in cooperation with the North Carolina Department of Agriculture, discusses the problem of agriculture after the war; Governmental assistance, 1921–1928; schemes for handling the surplus production, 1922–1929; the Federal Agricultural Marketing Act; how to organize cooperative marketing associations under the North Carolina statutes; the principles of efficient cooperative marketing; and what cooperatives can and can not do.

Appendixes include the text of Federal Agricultural Marketing Act, 1929; the North Carolina Cooperative Marketing Act, 1921; the North Carolina Mutual Exchange Act, 1925; and the marketing contract of the Eastern North Carolina Tobacco Growers' Marketing Association; and a table showing the estimated membership and business of farmers' associations in the United States by commodity groups, 1915, 1925, and 1930.

FOODS—HUMAN NUTRITION

Recent advances in the study of basal metabolism, I, II, E. F. DuBois (*Jour. Nutrition, 3 (1930), Nos. 2, pp. 217–228; 3, pp. 331–343*).—This comprehensive review, based upon an address given at the Marine Biological Laboratory, Woods Hole, Mass., August 5, 1930, is limited to the more important contributions of the preceding four years dealing with human basal metabolism. After a brief discussion of technic, the subject is treated under the headings of normal standards, metabolism of women, racial and climatic factors, obesity, basal metabolism and surface area, metabolism of children, mental states, endocrine products, basal metabolism in disease, and general reviews.

An extensive list of literature references is appended.

Metabolism of college women, C. M. Coons (*Oklahoma Sta. Rpt. 1927–1930, pp. 182, 183, fig. 1*).—In preliminary studies in an investigation undertaken to determine the cause of marked underweight in college women, basal metabolism tests were conducted on 58 women of college age. A new Benedict-Roth recording apparatus was used for the observations, which were made in the morning 12 hours or more after food and after a 30- to 45-minute resting period. The values obtained averaged 10.6 per cent below the Aub-Du Bois standards, the lowest rate being −27 per cent. Only 6 subjects had metabolic rates above these standards.

The value of foodstuffs for vitamin A, E. M. Hume and H. H. Smith (*Lancet [London], 1930, II, No. 25, pp. 1362, 1363*).—Taking as the minimum dose of vitamin A the smallest dose upon which all the rats receiving it are able to survive, a few tests are reported on the vitamin A value of fresh spinach, fresh green cabbage, and New Zealand butter following a technic described previously (E. S. R., 60, p. 93). The values obtained indicate that the minimal daily rat dose of spinach is 20 mg. or less, of cabbage more than 20 but less than 80 mg., and of New Zealand butter 28 mg. or less. The corresponding dose of carotene by the same method was 0.003 mg. Although too few rats were used for the values to be considered conclusive, it is thought that with graded dosage, using 3 or 4 rats for each dose, it is possible to differentiate doses varying by 50 per cent or less by this maintenance method.

"It is also suggested that the evaluation of foodstuffs might be standardized against the value of carotene, if a specification were agreed upon as to the properties—for instance, melting point and color index—to be required from the carotene which should function as the standard. If a mapping out of the value of the commoner foodstuffs for vitamin A were carried out it would be an important step towards determining the adequacy or inadequacy of human dietaries in this respect."

Effect of drying and sulphuring on vitamin C content of prunes and apricots, A. F. Morgan, A. Field, and P. F. Nichols (*Jour. Agr. Research [U. S.], 42 (1931), No. 1, pp. 35–45*).—In continuation of the studies from the California Experiment Station on the vitamins in dried fruits (E. S. R., 64, p. 495), vitamin C tests were conducted on Agen prunes of the 1927 and 1928 crops and Royal apricots of the 1928 and 1929 crops dehydrated and sundried by the customary methods, with and without SO_2 treatment, and for purposes

of comparison of fresh fruit ground, packed in 8-oz. tin cans, frozen solid, and stored at −17° C. until used. In the case of the apricots the cans of a second lot were evacuated and filled with nitrogen before the fruit was frozen.

According to the summary of experimental results reported, the minimum dosages in terms of the equivalent of fresh fruit of the various products required to protect standard guinea pigs against scurvy were as follows: For the prunes, fresh frozen 1927 crop 12 and 1928 crop from 10 to 20 gm. daily; dehydrated and sundried, sulfured, lye dipped 1928 crop 11 to 18 gm.; dehydrated, sulfured, lye dipped 1927 crop 20; and dehydrated, sulfured, not lye dipped 1928 crop 33+ gm. Of the sundried, sulfured, not lye dipped 1928 crop and the unsulfured, both dehydrated and sundried 1927 and 1928 crops 32 and 44 gm., respectively, afforded no protection against scurvy.

For the apricots the fresh frozen not evacuated samples of the 1928 crop afforded no protection in doses of over 30 gm. daily, while the fresh frozen evacuated samples of the 1929 crop furnished complete protection in 15 gm. daily doses. Of the dehydrated and sundried apricots containing more than 470 parts per million SO_2 1928 and 1929 crops, doses of from 17 to 38+ gm. were required for complete protection, while of those containing less than 470 parts per million amounts over 81 gm. daily were not protective.

The results confirm the earlier findings reported for peaches in showing that sulfur dioxide tends to preserve the vitamin C content of fruits on drying, and further that a certain minimum of SO_2 is required to insure this protection. Loss of vitamin C in nonevacuated frozen apricots is attributed to retention of tissue respiratory oxygen in the nonevacuated lots. Attention is called to the fact that the 1927 crop of prunes, with a higher vitamin C content than the 1928 crop, also had a higher moisture content, but that the opposite was true of the vitamin A content.

Vitamins do not influence digestion, R. St. Julian (*Oklahoma Sta. Rpt. 1927–1930, p. 181*).—From determinations of the coefficients of digestibility of proteins, fats, and carbohydrates in rats on a complete ration and on rations deficient in vitamins A, B, G, and D, respectively, and from similar determinations on guinea pigs on complete and vitamin C-deficient diets, the conclusion is drawn that digestion is not influenced by the presence or absence of these vitamins.

The effect of successive diminutions of vitamin A in the food on the nutrition and vitality of albino rats, E. L. Batchelder (*Diss., Columbia Univ., New York, 1929, pp. 36, figs. 2*).—The experiments described in this dissertation were designed to show differences in vigor which might be discernible in rats fed diets containing amounts of vitamin A intermediate between the two extremes in the diets employed by Sherman and MacLeod in an earlier study on the relation of vitamin A to growth, reproduction, and longevity (E. S. R., 54, p. 488). To this end a comparison was made of the life history of rats receiving diets containing 8.22, 4.11, 2.06, 1.03, 0.51, and 0 per cent of butterfat, respectively. Tests of the individual constituents of the basal diet—ground whole wheat, skim milk powder, and Crisco—showed that they contributed but little to the vitamin A content of the diets, which decreased nearly in proportion to the amount of butterfat present.

For each decrease in the percentage of butterfat there was a shorter survival period. "A lower weight at all ages was observed for each decrease in butterfat below 4.11 per cent. A significant difference in the weight of young at 28 days was found between 4.11 and 2.06 per cent, in the number of young reared below 2.06 per cent, and of young born below 1.03 per cent butterfat. Rate of growth, duration of reproductive life, and longevity also showed a significant decrease below 1.03 per cent. Fourth generation rats were successfully reared

on 8.22, 4.11, and 2.06 per cent butterfat. Fourth generation rats were born but only a small proportion reared on 1.03 per cent, and a very few third generation rats were born but not reared on 0.51 per cent butterfat."

In estimating the contribution of the various constituents of the basal diet to its vitamin A content, a basis of comparison was used which is thought to be practical for the estimation of vitamin A in food materials containing amounts too small to be determined by any method involving rat growth. The method consists essentially in taking as a standard the results of feeding to matched animals graded amounts of a food moderately rich in vitamin A, and determining what fraction of the daily dose necessary to produce unit growth is sufficient to produce a significant increase in survival over that of negative controls. As an illustration, it was found that as the sole source of vitamin A 67 per cent of whole wheat caused an increase in survival of only 5 days and 25 per cent of skim milk powder an increase of only 6 days over the negative controls. With graded amounts of whole milk powder as the source of vitamin A, the smallest amount of milk powder used prolonged the survival period over that of negative controls by 16.8±3.9 days, while on 8 times this amount the animals survived and gained an average of 35 gm. in the 8 weeks' period. Since 0.5 per cent butterfat caused a net gain over the same length of time of 39 gm., this amount represents about 8 times as much vitamin as the lowest amount of whole milk powder, which in turn was slightly superior to the combination of whole wheat and skim milk. It was, therefore, concluded that the vitamin A contributed by whole wheat and skim milk powder amounted to less than one-eighth that of butterfat.

Quantitative differentiation of vitamins A and D, II, H. C. SHERMAN and H. K. STIEBELING (*Jour. Biol. Chem., 88 (1930), No. 3, pp. 683–693*).—This paper supplements an earlier one on the same subject (E. S. R., 57, p. 293) by describing in detail the technic which has been developed in the senior author's laboratory for the quantitative determination of vitamins A and D.

The technic for A is essentially the same as described previously by Sherman and Burtis (E. S. R., 60, p. 194). It is noted that in an analysis of almost 200 experiments in which the rate of gain was approximately the standard unit of 3 gm. per week, shortening the test period from 8 weeks to 5 would have resulted in only slightly less regular findings and a somewhat higher average rate of gain per week. When quantitative studies of the effect of some treatment on vitamin A are being made, it is recommended that carefully matched rats from the same litter be fed the treated and untreated material in such daily amounts as have been shown to contain one unit of vitamin A in the case of the untreated material. In estimating the vitamin A values of two or more materials which promote growth at rates differing from each other and from the standard, the use is recommended of such standards as have been proposed by Batchelder as noted above.

In discussing the technic for determining vitamin D, the authors call attention to the fact that rats from the Sherman stock diet B, when placed on a diet supposedly adequate except for vitamin D, continue to gain on the average from 6 to 8 gm. per week for about 3 months before growth ceases, while on a diet otherwise adequate but free from A. Cessation of growth usually occurs in from 4 to 5 weeks. The relatively high storage of vitamin D on this diet, as has been noted previously (E. S. R., 62, p. 494), makes the extent of calcification a more satisfactory quantitative measure of vitamin D than growth.

The basal vitamin D-free diet and general technic have been described previously (E. S. R., 62, p. 494). Quantitative comparisons of the vitamin D content of foods are made by finding the amounts necessary to induce a degree of calcification midway between the minimum values obtained without added D and the

maximum values obtained with an abundance of supplementary vitamin D. "It should be emphasized that this method is feasible only when the groups of animals used for testing vitamin D can be compared with two control groups each containing representatives from the same litters and matched in sex and weight, one receiving no added vitamin D, the other receiving a fixed liberal supply. Probably animals from at least five or more litters should be used for obtaining the average fiures for each group."

Carbohydrate metabolism in avitaminosis, III–V, B. Sure and M. E. Smith (*Soc. Expt. Biol. and Med. Proc.*, *28* (*1913*), *No. 4*, *pp. 439–442*).—Following the same technic as in the previous studies of the series (E. S. R., 62, p. 896), the authors have continued their investigation of the effect of various single vitamin deficiencies on the carbohydrate metabolism of rats.

III. *Vitamin A deficiency on concentration of sugar, alkaline reserve, and glycogen content of the liver* (pp. 439, 440).—The experimental basal diet used in this study consisted of casein (hot alcohol extracted) 20, Northwestern yeast 10, salts (McCollum 185) 4, lard 2, and irradiated dextrin 64 per cent. In some cases the lard was replaced by from 1 to 2 per cent of butterfat in order to prolong the experimental period by furnishing a small but insufficient amount of vitamin A. The experiments were continued from 80 to 150 days.

No significant changes were observed in the concentration of true blood sugar, but in many cases the concentration of apparent sugar was considerably higher in the pathological animals than in the controls. Only 2 of the 24 animals on the deficient diet showed any marked reduction in CO_2 volume capacity. The livers of the A-deficient rats had practically the same glycogen content as the controls. On autopsy gross pathological changes were found in the respiratory tract, evidence of bronchial pneumonia being most common.

The food records showed that although there was a reduction in food intake it was not as pronounced as in vitamin B deficiency. Although no specific relation could be detected between the water and food intake in advanced stages of A deficiency, an excessive consumption of water was noted in some instances when the food intake was very low.

IV. *Vitamin D deficiency on concentration of sugar, alkaline reserve, and glycogen content of the liver* (pp. *440–441*).—This study was conducted on 25 rats on the Steenbock-Black rachitic ration No. 2965. Of these, 13 were supplied with vitamin D either by the addition of 6 drops of cod-liver oil per rat per day or by irradiation of the ration. At the end of the experiment the line test showed that 2 of the rats on the deficient diet had severe rickets and 10 moderate rickets. Of the controls, 5 showed absolutely normal and the remaining nearly normal calcification. The two groups showed no appreciable differences in true blood sugar, alkaline reserve, and in the glycogen content of the liver. High figures were obtained for apparent sugar, but this was true of the controls as well as of the vitamin-deficient animals. No changes in food and water intake were apparent.

V. *Vitamin G deficiency on concentration of sugar, alkaline reserve, and glycogen content of the liver* (p. 442).—In this study a total of 62 rats was used, consisting of 12 controls and 50 on the vitamin G deficient diet previously described by Thatcher, Sure, and Walker (E. S. R., 64, p. 498). Dermatitis was produced in 24 of these rats. "To summarize our results, neither arrest of growth nor loss of body weight nor accompanying dermatitis, associated with vitamin G deficiency, had any influence on apparent or true sugar or alkaline reserve. There was a reduction in the glycogen content of the liver in animals that had lost considerably in weight during periods of inanition."

Based upon their experience in this and other studies dealing with vitamin G deficiency, the authors conclude that the growth-promoting and antidermatitis

factors associated with the so-called antipellagric vitamin G are not synonymous. In most cases on the diet used in the present study dermatitis appeared while the animals were growing vigorously, while on the diet recommended by Sherman and Sandels (E. S. R., 61, p. 592) failure of growth resulted unassociated in most cases with dermatitis.

Fat-soluble vitamins.—XXX, The antirachitic value of cow's milk as modified by the feeding of irradiated yeast, H. Steenbock, E. B. Hart, and F. Hanning (*Jour. Biol. Chem., 88 (1930), No. 1, pp. 197–214*).—This continuation of the series of papers noted on page 769 reports data on the antirachitic value of milk from cows receiving with their feed varying amounts of irradiated and nonirradiated yeast and of cod-liver oil. In some instances butter from the same milk was tested. The weekly production of milk and butterfat of cows on rations containing 200 gm. or irradiated yeast daily was also recorded.

The antirachitic potency of the milk was increased by feeding the cows 50 gm. daily of irradiated yeast and to a greater extent by larger doses. Contrary to the effect of cod-liver oil, amounts as large as 200 gm. daily did not lower the milk production nor decrease the butterfat content. That 10 gm. of irradiated yeast daily increased antirachitic action was not clearly demonstrable in the milk, but a slight effect could be detected in the butter. With cod-liver oil, 180 gm. daily produced no greater change in the antirachitic properties of the milk than did the 10 gm. of irradiated yeast.

"It appears that the feeding of a standardized irradiated yeast may be considered as a practical measure for the production of a milk of standard antirachitic potency. It remains to be demonstrated whether irradiated yeast can be effectively used for the same purpose in the human dietary."

Fat soluble vitamins.—XXXI, Butter fat: Its antirachitic properties and its artificial activation, H. Steenbock and A. M. Wirick (*Jour. Dairy Sci., 13 (1930), No. 6, pp. 497–521*).—In continuation of the series of studies noted above, the authors, with the cooperation of B. M. Riising, have determined the conditions necessary to secure maximum vitamin D activity in butterfat by irradiation, the stability of the product under storage conditions, and the practical possibility of increasing the vitamin D activity of butter by the introduction of irradiated ergosterol.

A comparison of the curative and prophylactic methods for determining the antirachitic activity of butterfat led to the conclusion that the prophylactic method, with determinations of the percentage of bone ash, is more accurate than the curative method employing the line test. If the latter is selected, it is considered imperative to use a large number of animals on each level of intake (at least six and preferably more) and to use as criterion the incidence of a definite continuous calcium line at a certain level of intake in preference to successive increases in the degree of healing. In the greater part of the work reported in this paper the prophylactic method was employed, although in some instances the curative method was used.

The June butterfat used in the investigation was found to be so low in vitamin D that an intake of about 400 mg. per rat per day, or 5 per cent of the weight of the rickets-producing ration, was not sufficient for normal bone production. When irradiated under suitable conditions the antirachitic activity was increased about 20 times. The activity thus induced appeared to be stable to storage.

The addition of 10 mg. of irradiated ergosterol to each pound of butter increased the antirachitic activity of the butter 80 times, making the product twice as potent as cod-liver oil. Although this activation was excessive, the practical possibilities in increasing the vitamin D content of butter in this way were considered demonstrated.

In commenting upon increasing the antirachitic activity of foodstuffs by the incorporation of activated ergosterol, the necessity of strict control is emphasized. "It suggests itself that this may be done in the case of butter by restricting the marketing of a preparation used for this purpose to dilute solutions or by limiting it to colored solutions. The ergosterol, for instance, might be dissolved in butter color. Our preliminary tests have not as yet shown that it is feasible to add the ergosterol solutions in such preparations previous to churning. Further work remains to be done. Both direct and indirect activation have their shortcomings, and it remains to be determined if vitamin D can always be satisfactorily furnished in the human diet by direct irradiation.

"By their natural limitations of activatability, due to paucity in content of ergosterol or to lack of surface, direct irradiation of many food materials would prevent all danger of hypervitaminosis. Essentially, the advisability of the fortification of foods with vitamin D is primarily a problem of, first, what is the extent of the deficiency of the human diet in vitamin D and, second, to what extent is it absolutely essential that this deficiency be corrected? The practical fortification of the human diet in vitamin D offers no essential difficulties."

Further observations on the serum calcium and plasma cholesterol in health and disease and on the blood chemistry in osteomalacia, T. A. Hughes, D. L. Shrivastava, P. N. Sahai, and K. S. Malik (*Indian Jour. Med. Research, 18 (1930), No. 2, pp. 517–526*).—Further determinations of the serum calcium content of native Indians residing in Lahore, India, are reported, with values ranging from 11.1 to 12.7 mg. per 100 cc., thus confirming the earlier conclusion (E. S. R., 63, p. 194) of a higher serum calcium in normal residents of the Punjab than in normal inhabitants of temperate climates.

The oral administration of vitamin D or vitamins A and D caused an increase in serum calcium in 3 out of 16 individuals whose initial serum calcium was within normal limits.

Four patients with osteomalacia were treated with vitamin D and in 1 case with vitamin A also. In all 4 cases a rise in serum calcium was produced, and in all but the subject receiving vitamin A an increase in inorganic phosphorus. In this subject the changes in phosphorus and in plasma cholesterol were irregular. In the subjects with low initial calcium values the increase in blood calcium was slow, but there was progressive improvement as revealed both subjectively and by X-rays even when the serum calcium was stationary and below normal. It is concluded that in osteomalacia there is interference with the normal exchange of calcium and phosphorus between the blood and bones, as well as defective absorption from the intestines, and that some factor other than deficiency of vitamin D plays a part in the pathogenesis of the disease.

The feeding of gastric tissue in the treatment of pernicious anemia, H. M. Conner (*Jour. Amer. Med. Assoc., 96 (1931), No. 7, pp. 500–503*).—Of particular interest in this report of the author's experience in the treatment of pernicious anemia with gastric tissue, as first recommended by Sturgis and Isaacs and by Sharp (E. S. R., 62, p. 398), is the observation that the effects of tripe (pickled gastric tissue of cattle) were decidedly inferior to those produced by fresh or dried gastric tissue of swine. As the effective constituent is thermolabile, the material should not be cooked. The fresh material, after being ground in a seprasieve, is usually administered in orange, tomato, cranberry, or other fruit juice and the dried material in fruit juices or water. It is stated that the taste and smell of the fresh product are not objectionable to most patients. It is lower in price and considered by most to be better in taste than the dried product, but has the disadvantage of being somewhat difficult

to obtain and keep. Results obtained with different portions of gastric tissue were similar, and in a limited number of cases in which the mucosa was fed without the muscle coat equally satisfactory results were obtained.

Treatment of pernicious anaemia with hog's stomach, J. F. Wilkinson (*Brit. Med. Jour., No. 3654 (1931), pp. 85–91*).—In this report of observations on the value of hog's stomach in the treatment of 108 cases of pernicious anemia, various points are brought out concerning the method of the administration of the material. The desiccated material can be mixed with other foodstuffs provided heat is avoided. Owing to the very light bulky nature of the powder, the dosage should be measured by weight rather than by spoonfuls. The most satisfactory method of administering the maintenance dose of either the dried or fresh material is in small regular daily amounts, but the material may be administered in relatively large doses for a day or two every few weeks. This is of particular advantage when the fresh material is given. In the opinion of the author, "at the present time fresh hog's stomach is the cheapest and the most active form of treatment, while a certain desiccated preparation available is as cheap as fresh liver when taken in the average maintenance dose."

The treatment of secondary anemia: Further observations, J. H. Powers and W. P. Murphy (*Jour. Amer. Med. Assoc., 96 (1931), No. 7, pp. 504–507, figs. 4*).—In this study of the comparative merits of iron, whole liver, and liver extract alone or combined in the treatment of patients with anemia due to chronic hemorrhage or chlorosis, the method adopted for the evaluation of the anemic condition was the determination of the iron content of the whole blood by the Kennedy method. A value of 37 mg. of iron per 100 cc. of blood is considered to be the lower normal limit. The determination is said to be sufficiently sensitive to detect even the slight temporary anemia occurring during the normal menstrual cycle.

As thus determined, liver extract alone was found of no value in the treatment of these types of chronic secondary anemia. Iron in the form of ferrous carbonate and whole liver brought about a favorable response. The best results were obtained following the addition of both iron and liver.

The increasing prevalence of pellagra (*Jour. Amer. Med. Assoc., 96 (1931), No. 8, p. 614*).—In this editorial comment it is noted that the annual death rate in the United States from pellagra has risen from 2.5 per 100,000 in 1924 to 5.5 in 1929. The various theories which have been advanced concerning the cause of the disease are reviewed briefly, ending with the iron deficiency theory recently proposed by Bliss (E. S. R., 64, p. 595). Commenting upon this, the following statement is made:

"It would of course be extremely premature to endow these observations with the dignity of proof, but many clinical students of pellagra still believe that the last word regarding the nature of the disorder has not been spoken. There are, indeed, reasons for assuming that pellagra as seen in man represents a syndrome—a group of symptoms including stomatologic, gastroenteric, cutaneous, and nervous manifestations, each of which may have independent pathogenic origin. The hypothesis of multiple deficiencies with constant protean disease characteristics is somewhat appealing."

MISCELLANEOUS

Report of the Alaska Agricultural Experiment Stations, 1929, H. W. Alberts (*Alaska Stas. Rpt. 1929, pp. [2]+58, figs. 17*).—This contains the organization list and a report of the several lines of work carried on. Meteoro-

logical data and other features of the work are abstracted elsewhere in this issue.

Research leads to farm progress: Report of Oklahoma A. and M. College, Agricultural Experiment Station, 1926–1930, C. P. BLACKWELL ET AL. (*Oklahoma Sta. Rpt. 1927–1930, pp. 351, figs. 46*).—This, a report of the station for the period from July 1, 1926, to June 30, 1930, contains financial statements for this period, the organization list, and a report of the director and the various departments. The experimental work reported is for the most part abstracted elsewhere in this issue.

Bulletins and circulars available at the experiment station (*New York State Sta. Circ. 116 (1930), pp. 6, figs. 3*).—The list of publications here presented is arranged by subject matter.

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [January–February, 1931] (*Ohio Sta. Bimo. Bul. 148 (1931), pp. 32, figs. 8*).—In addition to seven articles abstracted elsewhere in this issue, this number contains Preparation of the Seedbed for Oats, by L. E. Thatcher (pp. 11–15) (E. S. R., 64, p. 624), and Public Responsibility in Forest Land Ownership, by E. Secrest (pp. 24–27).

Reports on the work of agricultural research institutes and on certain other agricultural investigations in the United Kingdom, 1928–1929 (*London: Min. Agr. and Fisheries, 1930, pp. 247*).—The investigations of the year are briefly summarized. A directory is appended.

Twentieth report of the Development Commissioners, being for the year ended the 31st March, 1930, R. CAVENDISH ET AL. (*[Gt. Brit.] Devlpmt. Commrs. Rpt., 20 (1929–30), pp. 247*).—This report includes a summary of research conducted in England, Scotland, and Wales with funds advanced under the Development and Road Improvement Funds Acts of 1909 and 1910.

Guide-book for the excursion of the Second International Congress of Soil Science.—Experimental institutions of the U. S. S. R. along the route of the excursion, A. I. SMIRNOV, edited by N. M. TULAIKOV (*Moscow: Organ. Com., Second Internatl. Cong. Soil Sci., 1930, vol. 1, pp. 38*).—A brief account is given of some of the experimental work under way in these institutions.

NOTES

Alaska Stations.—Dr. C. C. Georgeson, director from 1898 to 1928, died in Seattle, Wash., April 1 at the age of nearly 80 years. His life and work were discussed editorially in these columns at the time of his retirement (E. S. R., 57, p. 701).

Colorado College and Station.—The resignations are noted of J. W. Adams, in charge of the substation at Cheyenne Wells, to enter private business; G. W. Deming, assistant in agronomy, to accept a position with the U. S. D. A. Bureau of Plant Industry, with headquarters at Rocky Ford; Donald Cation, instructor in botany and assistant botanist, to become research assistant in plant pathology in the Michigan College; and Florence N. Schott, associate in research in home economics. George R. Henderson has succeeded E. J. Maynard, resigned to become head of the department of animal husbandry in the Utah College and Station.

Idaho University and Station.—The enrollment in the College of Agriculture for the current year has shown an increase of 26 per cent.

A commercial fellowship of $700 has been granted the department of dairy husbandry in recognition of a recent study on the standardization of milk with skim milk powder for the manufacture of Cheddar cheese.

Maine Station.—Dr. Warner Jackson Morse, director since 1921, died March 25 after a long illness.

Dr. Morse was born in Waterbury Center, Vt., October 30, 1872, and graduated from the Johnson (Vt.) Normal School in 1893 and the University of Vermont in 1898. From the latter institute he also received the M. S. degree in 1903 and the honorary D. Sc. degree in 1923, while the Ph. D. degree was bestowed by the University of Wisconsin in 1912. He served as instructor in botany and assistant botanist in the Vermont University and Station from 1901 to 1905 and as assistant professor of bacteriology and assistant botanist from 1905 to 1906. In the latter year he became plant pathologist in the Maine Station and continued in charge of that work until 1923. His pathological research had been largely with soft rots of vegetables, white pine blight, the effect of borax in fertilizers, and more recently with various diseases of potatoes and apples. He had been a councilor of the American Phytopathological Society, and in 1928 was appointed a member of the joint committee on publication of research of the Association of Land-Grant Colleges and Universities.

Massachusetts College.—Under legislation recently signed by the governor, the name of the institution has been changed from Massachusetts Agricultural College to Massachusetts State College. It is announced that no alteration in the scope of the college is contemplated, but that the change will more accurately reflect the broad field of educational activity in which the institution has been engaged since its establishment.

Michigan College and Station.—Two new units 76 by 22.5 ft. in size and a head house have been added to the greenhouse equipment for research. These units have been divided into seven sections, of which six have been allotted to plant pathology and one to plant physiology.

Addison M. Brown, prominently associated with the administration of the college and station from 1902 to 1922 as secretary of the institution, died March 2 at the age of 72 years.

Nebraska University.—W. W. Derrick, instructor in animal husbandry, has been appointed State extension agent in animal husbandry.

Cornell University and Station.—The State appropriations for the support of the College of Agriculture for the ensuing year will exceed $1,750,000, and the College of Home Economics will receive $300,000. Included in these amounts are net increases of $85,900 for personal services for the College of Agriculture and $54,570 for the College of Home Economics, of which $60,200 and $43,000, respectively, will be paid the university for accessory instruction furnished students enrolled in these colleges by other colleges of the university. There is also a special appropriation of $76,000 for the further development of soil classification and utilization studies and one of $60,000 for the purchase of additional livestock.

The State budget for 1931 includes $500,000 for a new building to house the departments of agricultural economics and rural social organization.

Oklahoma College and Station.—The legislature has appropriated $18,500 for a new horse barn, $5,600 for barns and experimental feeding sheds, $13,500 for the improvement of roads and fences on the college and station farm, and $22,500 for a meat laboratory which will be used for both college and station work.

The Mary Pemberton Nourse Memorial Fellowship of the American Association of University Women has been granted to the station, and work thereunder will be supervised by Dr. Callie Mae Coons, associate professor of household science and assistant in nutrition, who has been transferred to full time research in the station.

Pennsylvania College.—W. T. Henerey resigned March 1 as assistant professor of entomology extension.

South Carolina Station.—Dr. C. O. Eddy, associate entomologist, has been appointed associate entomologist in the Kentucky Station and will take up a study of the oriental fruit moth and codling moth in the orchards of western Kentucky.

South Dakota Station.—The legislature which has just adjourned reduced its budget for salaries by 10 per cent. The State appropriation for the station was similarly reduced on the assumption that part of this appropriation is used for paying salaries.

Texas Station.—*Science* notes that B. F. Dana, plant pathologist at the Temple Substation, has resigned to accept a similar position with the U. S. D. A. Office of Horticultural Crops and Diseases, with headquarters at the Oregon Station, for a study of curly top of vegetables.

Virgin Islands Station.—J. R. Ricks, formerly director of the Mississippi Station, has been designated as director and has entered upon his duties. Helen L. Cawley has been appointed assistant home demonstration agent, effective April 1.

Washington College and Station.—George Severance, head of the department of farm management and agricultural economics and vice dean of the College of Agriculture since 1919, died March 8 at the age of 57 years. Prof. Severance was a native of Michigan, graduated from the Michigan College in 1901, and the following year was instructor in agriculture in that institution. In 1902 he came to Washington as instructor in agriculture, and subsequently served as assistant professor of agriculture, professor of agronomy, superintendent of the Western Washington Station at Puyallup, head of the

department of agriculture, vice dean of the College of Agriculture, and for a time acting director of the station. During his long service he was particularly concerned with farm management practices in various sections of the State, and had been an authority for many years on the agriculture of the Pacific Northwest. He had unusual ability in adapting the scientific principles of agriculture to modern methods of farm management and conducted and supervised much research work. He was the author of 13 station bulletins and many additional reports and other papers dealing with the agriculture of Washington. An able teacher, he had enrolled in one or more of his classes the majority of graduates in agriculture from the college, and in this way exercised an unusual influence.

Carl Larson has been appointed specialist in irrigation investigations at the Irrigation Substation vice C. C. Wright, resigned. Kermit Groves has been appointed assistant chemist, effective April 15, vice Dr. J. R. Neller, resigned.

Wisconsin University and Station.—The university has leased for five years, with an option for purchase, a farm of 120 acres near the present holdings. The existing buildings will be supplemented by additional construction for the poultry research plant, which will be located in the center of the new area.

Plant Pathology in Rockefeller Institute for Medical Research.—A division of plant pathology is to be established in connection with the department of animal pathology at Plainsboro, N. J., 3 miles from Princeton University, and the combined laboratories will be known as the department of animal and plant pathology. A tract of approximately 800 acres is available for the work, which now permits of study of human pathology and the pathology of the lower animals and of plants in a single closely knit investigative unit. Dr. L. O. Kunkel, pathologist of the Boyce Thompson Institute for Plant Research, has been appointed in charge of the new division of plant pathology.

Mellon Institute Fellowship on Sugar.—A broad investigation into possible industrial uses for raw and refined sugar is contemplated under a multiple industrial fellowship to be sustained by the Sugar Institute, Incorporated. Among the phases to be investigated are the use of sugar in such technological processes as wood preservation, textile finishing, and the manufacture of adhesives, and as a raw material in various branches of chemical industry. A staff of four chemists is to begin this project, with the expectation of additions from time to time.

Agricultural Research Institute of Rumania.—This institute was established under a law enacted in 1927 and formally organized in 1929. It now contains sections of phytotechny and phytogenetics, chemistry, phytopathology, and rural economics, and it is expected that these will be supplemented with sections on animal production and rural engineering. It has also taken under its direction the Central Agronomic Station at Bucharest; the agricultural chemistry, agricultural technology, seed control, and medicinal plants stations at Cluj; the phytopathology station at Chişinău; the newly established machinery testing station at Bucharest; the agricultural plant improvement and experiment stations at Jassy and Cluj; and agricultural experiment stations at Mărculeşti and Tighina.

Humbert-Marie José Prize in Agricultural Economics.—The International Institute of Agriculture announces that a prize of 10,000 lire will be awarded annually for the best work on agricultural economics from a fund constituted in honor of the recent marriage of the Crown Prince of Italy and Princess Marie José of Belgium. The closing date for the submission of material for the first year is September 30, 1931, and the prize will be awarded on December 31. Participation will be restricted to works published within the two preceding

years by authors belonging to countries adhering to the institute. The adjudication will be in the hands of a jury of five, consisting of the president of the institute and four members nominated by the permanent committee in such a way as to represent five different nations. Copies of the regulations and further information may be obtained from the president of the institute at Rome.

New Journals.—*Analele Institutului de Cercetări Agronomice al României (Annales de l'Institut de Recherches Agronomiques de Roumanie)* is being issued by the Agricultural Research Institute of Rumania at Bucharest. It will publish only original papers by members or collaborators of the institute. Articles will be published in the Rumanian language, but followed by French, German, or English abstracts. The initial number contains the following: A Study of the Principal Soil Types of Rumania by the Plant Physiological Method, Determining Their Content of Nitrogen, Phosphoric Acid, and Potash and Their Need of Fertilizers, by T. Saidel and G. Ionescu Sişeşti (pp. 14–69); A New Bacterial Disease of the Tobacco Leaf in Rumania, by T. Săvulescu and I. Rădulescu (pp. 70–170); The Experimental Results with Chemical Fertilizers in 1928 under the Direction of the Institute of Agronomic Research of Rumania, by G. Ionescu Sişeşti and N. Dobrescu (pp. 193–213); Phyto-Sanitary Conditions in Rumania in 1928–29, by T. Săvulescu (pp. 214–266); The Economic Importance of the Volatile Oils and the Development of the Industry of These Oils in Rumania, by E. Kopp (pp. 267–277); and A Case of Esca (*Stereum necator*) on the Young Canes of Two-Year Old Grapes, by A. Billeau (pp. 278–281).

Bollettino di Zoologia is being published by the Union of Italian Zoologists at Naples. The initial number contains several short articles, among them the following: Some Laws of Teratogenesis, by S. Ranzi (pp. 5–7); Hereditary Behavior in the Crossing of Diverse Species of Fasianidi, by A. Ghigi (pp. 9–12); Multiple Factors of Antagonistic Type in the Crest of Poultry, by A. Taibell (pp. 21–25); Observations on the Biology of *Anopheles sacharovi* Favr., by D. Brighenti (pp. 27–30); and The Provision of the Mineral Matter Necessary for the Development of the Embryo, by S. Ranzi (pp. 35, 36).

Ecological Monographs is being published quarterly as the official publication of the Ecological Society of America by the Duke University Press at Durham, N. C. It is planned to deal with all phases of biology but to restrict its columns to ecological papers long enough to print 25 pages or more. The initial number contains The Rôle of the Sense Organs in Aggregations of *Ameiurus melas*, by E. S. Bowen (pp. 1–35); and An Experimental Study of the Water Relations of Seedling Conifers with Special Reference to Wilting, by R. Marshall (pp. 37–98).

The Economic Annalist is being issued monthly as a review of agricultural business by the Agricultural Economics Branch of the Canadian Department of Agriculture at Ottawa, Canada. The initial number announces that "it is expected that brief contributions of a research character will be included in each issue and that current happenings of an economic nature affecting agriculture, such as the activities of farmers' associations, will be reviewed."

Arquivos da Secção de Biologia e Parasitologia is being issued from time to time by the Zoological Museum of the University of Coimbra of Portugal. The initial number contains original articles as follows: Notes on the Study of Species of the Family Cleridae Found in Portugal, by J. M. Corrêa de Barros (pp. 1–25); The Invasion of Locusts in Portugal, by A. G. Ramalho (pp. 27–47); and The Fauna of the National Forests, by A. F. de Seabra (pp. 49–82).

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Cell chemistry (*Connecticut State Sta. Bul. 322 (1931), pp. 114, 115*).—In an extension of the study of the tobacco plant by the Tobacco Substation at Windsor (E. S. R., 62, p. 833), it was shown that tobacco seed does not contain nicotine, although "appreciable amounts of this alkaloid were formed during the development of the sprouts after 12 days' germination." The seed was shown to contain the high proportion of 42 per cent of oil, protein in appreciable quantity, and a very low proportion of carbohydrate. A crystalline preparation of one of the tobacco-seed proteins was obtained, and a specimen of the rare alkaloid nicotimine, which accompanies nicotine in tobacco, was isolated.

The conductance and activity coefficients of glutamic and aspartic acids and their monosodium salts, W. M. HOSKINS, M. RANDALL, and C. L. A. SCHMIDT (*Jour. Biol. Chem., 88 (1930), No. 1, pp. 215–239, figs. 11*).—"Conductivity data for solutions of aspartic and glutamic acids and their monosodium salts at 0° are given," in a contribution from the University of California, and "the transference numbers and the degree of ionization of aspartic and glutamic acids and their monosodium salts in solution at 0° have been calculated. The data indicate that the free acids are but little ionized, while the sodium salts are highly ionized."

Determinations were made also of the freezing points of solutions of aspartic and of glutamic acids and of their monosodium salts.

"These data have been used to calculate (a) the activity coefficients of aspartic and glutamic acids and their monosodium salts in solution, considering them as uniunivalent electrolytes; (b) the activity coefficients of the undissociated part of aspartic and glutamic acids in solution. The data indicate that (a) the undissociated part of aspartic and glutamic acids in solutions exists to a considerable extent as neutral aggregates; (b) the ionized part of the monosodium salts of aspartic and glutamic acids in solution probably exists to a slight extent as ionic aggregates or micelles. It is pointed out that the use of the 'overall' activity coefficient avoids all the uncertainties involved in the arbitrary selection of a dissociation constant and gives a convenient measure of the activity of the solute. It is further shown that with weak acids which form micelles the dissociation constant is not a convenient quantity for exact calculations."

The chemical constitution of the carotenoid pigments and the relation of carotene to vitamin A.—A review, J. M. GULLAND (*Jour. Soc. Chem. Indus., Chem. and Indus., 49 (1930), No. 41, pp. 839–847, figs. 2*).—This review supple-

ments one by Drummond on the progress of vitamin A research up to the end of 1929 (E. S. R., 63, p. 109). After a brief account of the present status of belief concerning the relationship of vitamin A to carotene, the chemical constitution of the synthetic polyenes is discussed, followed by the natural carotenoid pigments, including the pigments of saffron, lycopin, carotene, xanthophyll, lutein, fucoxanthin, physalien, and capsanthin. An extensive list of literature references is appended.

A sixty cycle conductivity assembly for biological fluids, F. W. Sunderman (*Jour. Biol. Chem., 88 (1930), No. 1, pp. 61–66, figs. 2*).—Report is made from the University of Pennsylvania Medical School of an apparatus and method more rapid in operation and more economical of the material under examination than is the standard Kohlrausch procedure. The method is adapted for a 60-cycle alternating current, "retains the simplicity of operation of the ionometer, has the advantage of the bridge principle, and is in certain respects more convenient. It consists of a 60-cycle, 110-volt bridge with an A. C. galvanometer as a null-point indicator and a cell of high resistance and small capacity," the cell being shown in a drawing.

"The bridge has a slide wire calibrated in reciprocal megohms. By means of a double-throw switch a compensator resistance may be inserted in one of the arms of the bridge to correct, respectively, for changes in cell constant and for deviations in temperature from 20°, so that it is possible to obtain directly readings expressed in terms of specific conductivity at 20°." The apparatus is considered well adapted "for certain clinical and biological measurements of conductivity in which no high degree of precision is required."

The estimation of bromides in biological material, L. D. Behr, J. W. Palmer, and H. T. Clarke (*Jour. Biol. Chem., 88 (1930), No. 1, pp. 131–135*).—Report is made in this contribution from Columbia University, of "a simple and moderately accurate method . . . for the estimation of bromides in biological fluids, based on the selective oxidation of bromide by permanganate in dilute phosphoric acid."

It was found that "bromides can be almost selectively oxidized by permanganate in phosphoric acid solution, and that the resulting bromine can be quantitatively transferred to carbon tetrachloride. In the presence of much chloride a small proportion of chlorine is also taken up by the carbon tetrachloride; the separation can, however, be made practically complete by reducing the liberated halogens with sodium sulfite and repeating the process two or three times. Under the conditions adopted, any iodide which may originally have been present is oxidized to iodate and thus escapes extraction by the organic solvent."

In the preliminary destruction of organic matter, "no appreciable loss of bromide occurs when the incineration is conducted in platinum vessels at a temperature of 460–475°, in presence of potassium hydroxide." The use of nickel dishes, on the other hand, "leads not only to notable losses, especially in the case of blood, but also to profound corrosion of the metal."

The colorimetric determination of manganese in biological material, M. B. Richards (*Analyst, 55 (1930), No. 654, pp. 554–560*).—The periodate method of Willard and Greathouse (E. S. R., 38, p. 204) was found preferable to the persulfate method in that it requires no catalyst, and was deemed by its authors to be free from various faults of the methods previously known.

For the minute quantities of manganese here dealt with, however, their finding that increases in acidity increased the rate of color development required modification, since "while this is true for the concentrations of 15 per cent sulfuric acid and over, with which they chiefly deal, it is not quite

accurate where lower acidities are concerned. For all the amounts of manganese tested (0.0025–0.5 mg.) the rate of oxidation appears to be a minimum when the concentration of sulfuric acid is about 9–10 per cent, the color appearing only very slowly at this concentration. Above this point the rate does increase with increasing acidity, but below it the rate increases as the acidity diminishes. Below 1 per cent the color develops very rapidly, but the solutions show the same yellowish tint and tendency to rapid fading as are found when the acidity is too great." Accordingly, "it is recommended that in dealing with animal tissues conditions should be regulated so that the final acidity is about 5–6 per cent."

The essential features of the procedure are contained in the following directions:

"Ash the material as completely as possible (in a silica basin) at a low-red heat, and evaporate to dryness with a little concentrated hydrochloric acid. Add a few cubic centimeters of sulfuric acid (33 per cent by volume), and 3–4 drops of concentrated nitric acid, and evaporate carefully to dryness on a water bath and sand bath, finishing off by gentle ignition over a Bunsen flame. Add 2–2.5 cc. of sulfuric acid (33 per cent) and a little water, and evaporate to white-fuming stage, thus removing all traces of chlorides. After cooling, dilute and filter into a small flask (50 cc.) for oxidation. Add to the solution one or two small pieces of pumice stone, previously purified by boiling with 5 per cent sulfuric acid and a little periodate. Evaporate down to about 10 cc., when the concentration of sulfuric acid will be 5–6 per cent (allowing for the loss of acid at the fuming stage), and the solution is ready for oxidation.

"*Oxidation.*—Add 0.3 gm. of sodium periodate (or potassium periodate), and insert a loosely-fitting pear-shaped glass stopper in the neck of the flask. Heat to boiling, and immerse in boiling water for 30 minutes. . . . If the solution has sufficient color to require dilution, either (a) dilute to the appropriate volume with 5 per cent sulfuric acid that has been boiled with a little periodate, or (b) add water till it has nearly the required dilution, and heat for 15 minutes longer in the bath. Transfer to a calibrated flask, make up to volume, and estimate the manganese by comparing with the standard solution.

"*Colorimetric tubes.*—The tubes used are 10-cc. calibrated cylinders of uniform bore (with a total capacity of 12–13 cc., and length of 12–13 cm.), graduated in tenths of a cubic centimeter, and made without the usual flange at the bottom, so that the tubes can be held closely together for the color-comparison. . . .

"*Standard solutions:* (a) *Stock solution of manganese sulfate.*—Pure potassium permanganate (0.144 gm.) is dissolved in about 100 cc. of water, and reduced by sulfur dioxide. . . . The solution is heated till the reaction takes place, and the excess of sulfur dioxide is then boiled off. . . . Dilute to 1 liter. (1 cc. of this solution=0.05 mg. of manganese.)

"(b) *Standard solution for comparison.*—Oxidize 20 cc. of stock solution with periodate in the usual way, and make up to 1 liter with 5 per cent sulfuric acid (previously boiled with periodate). (1 cc. of this solution=0.001 mg. of manganese.)"

A study of the antimony trichloride color reaction for vitamin A, III, IV, E. R. Norris and A. E. Church (*Jour. Biol. Chem.*, *89* (*1930*), *Nos. 1, pp. 421–435, figs. 8; 2, pp. 589–598, figs. 3*).—A continuation of the series of papers noted previously (E. S. R., 63, p. 708).

III. *The effect of concentration of reagent used, and the stability of the chromogenic substance to light.*—Attention is called to the differences in the concentrations of antimony trichloride used by various workers in the color

test for vitamin A, and a series of experiments is reported showing the influence of the concentration of antimony trichloride on the color produced by various amounts of cod-liver oil and an unsaponifiable extract of cod-liver oil. The antimony trichloride was used in concentrations of 1.7, 4.3, 10.9, 19.2, and 36.3 gm. per 100 cc. of solution. The first four concentrations were used at the temperature of an ice and water bath and the other at room temperature. Cod-liver oil was diluted with anhydrous chloroform to concentrations of 50, 25, 12.5, 6.25, 3.125, 1.56, and 0.78 per cent. The technic outlined in previous papers was followed, readings being taken at 30 seconds with a Lovibond tintometer.

At low color values the variations of the observed color with different concentrations of antimony trichloride were slight, but at color values above 5 blue units relatively large variations in color were produced with varying concentrations of the antimony trichloride.

With high concentrations of oil the observed colors at 30 seconds appeared to be dependent upon the light used for the measurement of the color whether reflected or direct and of low or high intensity. The most marked difference was the more rapid development of red with the more intense light, with a tendency to a more rapid fading of the blue.

To determine which wave lengths of the visible spectrum are most destructive of the chromogenic substance of cod-liver oil, samples of a chloroform solution of the unsaponifiable matter of cod-liver oil were exposed under constant temperature to nonfiltered light and light filtered, respectively, through blue, green, and red filters transmitting wave lengths of less than 520, between 500 and 650, and more than 595 $\mu\mu$. As determined colorimetrically there was marked destruction of the chromogenic substance when exposed to white or blue light and practically no change with green and red light, showing that the destruction is due to light of wave length less than 500 $\mu\mu$. Similar results were obtained with a 25 per cent solution of cod-liver oil and with another series in which the unsaponifiable extract of cod-liver oil was used. In this series one tube was left in darkness and the other three exposed to light through amber and blue filters and no filter, respectively. The amber filter, transmitting light of wave length greater than 515 $\mu\mu$, afforded almost complete protection.

Other experiments are reported showing that the rate of destruction on exposure to light is only slightly increased by increasing the temperature of the solution, but markedly increased by the presence of oxygen.

IV. The source of vitamin B complex in the biological assay of vitamin A and the stability of vitamin A and of the chromogenic substance in various diluting oils.—Further data are given, showing the errors which may be introduced into biological assays for vitamin A, at least in cod-liver oil, if enough of the vitamin B complex is not present. It is emphasized that "simply feeding a definite amount of yeast, as 10 per cent of the diet, does not always insure ample supply of the factors of the vitamin B complex nor give comparable results. From the symptoms obtained, it would seem that dried yeast varies most in the heat-labile factor, vitamin B. If the source of vitamin B complex is sufficiently great, a premature flattening of the growth curve in testing for vitamin A after a period of depletion was not observed, but if the diet contains some substance having a physiological action, such as traces of isoamylamine or choline, not sufficiently balanced by the source of vitamin B complex, the animal may seem to be normal for a few weeks before the effects become apparent. Near the critical point of balance between the source of vitamin B complex and the source of toxic substance, considerable individual variation is often observed, partly due to differences of appetite and food intake."

Another source of error in testing liver oils or their unsaponifiable extracts for vitamin A is the possible destruction of the vitamin by the oil used as diluent. Data are reported showing the instability of the chromogenic substance in various oils. The substance proved to be very unstable in peanut oil, quite unstable in olive oil, and fairly stable in coconut oil, although different samples of the coconut oil were found to vary in this respect, some giving considerable destruction. The coconut oil also has the disadvantage of being a solid when cooled. The addition of a small amount of hydroquinone was found to prevent the destruction of vitamin A with peanut oil but not entirely with olive oil.

A simple spot-plate test for nitrate nitrogen in soil and other extracts, M. F. MORGAN (*Science, 71 (1930), No. 1839, pp. 343, 344*).—Noting that "the diphenylamine test, usually conducted as a 'ring' test, gives purely qualitative results," the blue color of the ring disappearing when the sulfuric acid reagent and the tested liquid are mixed because of the dilution of the acid below the 70 to 90 per cent concentration required for the existence of the blue compound, the author of this contribution from the Connecticut State Experiment Station points out, further, the need for "a quick and simple nitrate test for soil extracts, drainage waters, plant juices, or plant extracts that gives approximate quantitative results."

To meet this need, "the author has applied the principle of the very sensitive diphenylamine color reaction to a spot-plate technique. The reagent is a freshly prepared solution of 0.05 gm. of diphenylamine in 25 cc. of concentrated C. P. sulfuric acid. This is conveniently used from a glass-stoppered bottle of clear glass. The writer has attempted to use amber glass containers, but for some reason the reagent is contaminated by contact with the ground glass stopper of the amber-colored dropping bottle. Hence it seems preferable to make up at once only a sufficient amount of the reagent for use within two or three days' time, rather than attempt to store it in only partially light-proof bottles which might produce contamination.

"A common artist's slab with circular depressions 1 in. in diameter and ¼ in. deep is the most convenient vessel for conducting the test. One drop of the solution to be tested is transferred to one of the depressions by means of an eye-dropper pipette. Four drops of the reagent are added, and the liquid stirred with a 2-in. glass rod until a full color develops, which requires about 2 minutes. The intensity of the blue color is an approximate quantitative measurement of the nitrate nitrogen content, within the limits of from 1 to 25 p. p. m. of nitrates expressed as nitrogen. Above about 25 p. p. m. the blue color is so intense that little variation can be observed. In such cases the liquid to be tested must be diluted five, ten, or more times, so that one drop of the diluted liquid will fall within the above limits. In such cases the final test is on the basis of one drop of the diluted liquid to four drops of the reagent, with calculation of results on the basis of the dilution. A color chart of satisfactory accuracy can be made up with water colors."

METEOROLOGY

Oceanic, continental, Mediterranean, and boreal climatic influences and mountain climate in Europe, as synthetised and represented by characteristic plants, compiled by P. TELEKI and ZOLTÁN DE NAGY (*Geogr. Inst., Budapest, Pub. 1 (1930), pp. 11, pls. 7; Eng. trans., pp. 1–3*).—A series of maps with explanatory text are given in an attempt to show the effects of the various climatic influences in Europe as indicated by the distribution of certain char-

acteristic cultivated and wild plants, including the grape, maize, chestnut olive, orange, ivy, holly, box, fig, spruce, Scotch pine, birch, wintergreen, Veronica, cherry, maple, almond, licorice, fir, and a few others.

The author expresses the opinion that "there is no better way of characterizing climate as an entire whole, and not broken up into its elements, than through plants. This method of characterization and representation is of particularly great value to those engaged in the study of economics. Characterization through plants is much truer to nature; representation by way of them contains far less of the abstract than the representation by maps of the single elements, single phenomena, of climate."

Historical maps relating to the peoples and empires of the steppe belt of east Europe toward the end of the great migration are also included because, as stated, "they afford a good explanation of the connection between natural and historical phenomena."

Contributions to the knowledge of the microclimate in grain fields before outbreak of rust [trans. title], R. FLEISCHMANN (*Idöjárás, 34 (1930), No. 7–8, pp. 101–107; Ger. abs., pp. 133–137*).—From an intensive study of temperature and moisture conditions immediately surrounding rye and wheat plants in the field, the author concludes that the high absolute and relative humidity combined with higher temperature toward midday, commonly prevailing in standing grain, furnishes optimum conditions for the development of rust. Further studies of this kind are advocated.

Forests and rainfall, J. W. NICHOLSON (*Empire Forestry Jour. [London], 9 (1930), No. 2, pp. 204–212*).—The influence of forests on occult precipitation, cyclonic rain, orographical rain, and instability or continental rain is discussed, but the article deals particularly with the author's observations on instability rain in East Africa and India. From these he concludes that "under certain conditions forests tend to increase instability rain, more especially during seasons of drought, which is the time when extra rain is most valuable.

"It has been shown that forests can influence rainfall, and the evidence that they do influence it is, in East Africa at any rate, more positive than negative in character. But one can not claim that this positive influence has been proved beyond scientific doubt, nor that conclusions arrived at in Kenya or Uganda will apply elsewhere."

[Meteorological conditions at the Prescott Dry-Farm, Arizona, 1912–1927], S. P. CLARK (*Arizona Sta. Bul. 136 (1931), pp. 583–602, figs. 3*).—The available data for rainfall, temperature, and frost-free periods in this region are summarized.

"The rainfall at Prescott is very irregular in amount and seasonal distribution. The lowest annual precipitation on record was 7.58 in. in 1924, and the highest was 39.47 in. in 1905. The average rainfall for the 36 years, 1892 to 1927, was 16.43 in. During 12 years of this period the rainfall has been above this average. The Prescott district has two periods of rainfall, which come from January to March and from July to September. The summer rainfall is usually much heavier than during the winter months. . . . Over a period of 36 years, only twice, in 1917 and 1926, was there sufficient moisture in April, May, or June to put the ground in condition for planting spring crops. This is the critical period for maturing winter crops and for the preparation of the ground and the planting of summer crops. . . . The summer rains . . . often come in heavy downpours of short duration, causing excessive run-off, or they may come in light showers over a period but not sufficient to soak the ground enough for plant growth. A rain of an inch or more is necessary to put the soil in condition for crop growth, when it is so extremely dry after months of drought."

The mean annual temperature during the period 1910–1927 varied from 50.2° F. in 1912 to 72.9° in 1910. The lowest temperature, —6°, was recorded in January, 1910; the highest, 104°, in July, 1925. The average frost-free period was 177 days, ranging from 124 in 1911 to 227 in 1913.

Meteorological observations, [January–February, 1931], C. I. GUNNESS and K. M. WHEELER (*Massachusetts Sta. Met. Ser. Buls. 505–506 (1931), pp. 4 each*).—Summaries of observations at Amherst, Mass., during January and February, 1931, are given, with normals and extremes for these months during previous years.

Agricultural meteorology of Indo-China [trans. title], P. CARTON (*Agr. Prat. Pays Chauds, n. ser., 2 (1931), No. 9, pp. 199–209, figs. 4*).—The Bureau of Climatology and Agricultural Meteorology, organized in 1926 in the Meteorological Service of Indo-China, is described. The bureau receives data from 26 meteorological stations, 65 climatological stations, and 354 rainfall stations. Its work is confined to studies in climatology and agricultural ecology, in which it has the collaboration of specialists in coffee, tea, rubber, sugarcane, cinchona, and other economic plants, and of directors of experiment stations and plantation owners, as well as of the agricultural hydraulic service, especially in the study of evaporation and winds.

SOILS—FERTILIZERS

[Connecticut soil investigations] (*Connecticut State Sta. Bul. 322 (1931), pp. 133–136, fig. 1*).—The following items are noted:

Fertilization of vegetables.—In a single year's comparison between 2,000 lbs. of a 5–8–7 complete fertilizer and 40 tons of New York horse manure, radishes, spinach, early beets, lettuce, and sweet corn were better on the fertilizer plat. Tomatoes, squash, cucumbers, peppers, cauliflower, cabbage, endive, and late spinach were better on the manure plat. The addition of 20 tons of manure to 2,000 lbs. of 5–8–7 complete fertilizer increased the yields of radishes, sweet corn, squash, tomatoes, peppers, cauliflower, cabbage, endive, and late spinach. The addition of a side dressing of extra nitrogen to plats that had already received 2,000 lbs. of 5–8–7 complete fertilizer broadcast at planting time increased yields of early beets, sweet corn, squash, and tomatoes, and decreased yields of lettuce, cucumbers, and peppers. A comparison between 2,000 lbs. of 5–8–7 with 2,000 lbs. of 5–8–12 showed that extra potash increased the yields of radishes, beets, squash, and peppers, and decreased yields of lettuce (New York head). The use of less phosphoric acid increased the yields of radishes, early beets, peppers, and onions, and decreased the yields of lettuce, carrots, and cucumbers. The liming of a soil which showed an original pH value of 5.5 increased the yields of spinach, lettuce, late beets, and cucumbers. High analysis fertilizer gave better yields with radishes, early spinach, lettuce, and early beets, and poorer yields with late beets and cucumbers.

Fertilizer needs specific.—Pot experiments on a large number of types of soil taken from 70 fields indicated that soils which have received lime and fertilizers vary in their present needs rather with the individual field than with the soil type.

Nitrogen loss revealed by lysimeters.—The lysimeter equipment in the first year of its use indicated that heavy rains in late May and mid June washed out of Connecticut tobacco fields more than half of the nitrogen applied to give a quick, healthy growth to seedling plants. More leaching occurred in the first 30 days of tobacco field growth than in the first four months of

the summer before, which was unusually dry. The character of the soil was found to be a powerful influence on the amount of plant nutrients that wash through with rain. "Not only does the soil affect the leaching, but it influences the rate at which plant nutrients become soluble and thus are susceptible both to being absorbed by the plant and to being washed away. In the tobacco-growing season, Enfield fine sandy loam lost less than half the nitrogen that three other soils lost, whereas Merrimac sandy loam and Merrimac coarse sand were drained quite heavily." Of a total rainfall of 32 in., 23 in. were removed by the tobacco plant or evaporated from the soil in a year's time, only 9 in. passing into the drainage tanks.

"Of the four forms of nitrogen tested on the various soils, nitrate of soda was the only one completely leached out in one year. Potash losses were practically independent of nitrogen treatments and were chiefly affected by the type of soil. Phosphorus was not leached except in negligible quantities. Manure was found slow to nourish the plant, and some symptoms of nitrogen starvation were seen before the end of the season on plants raised on manure alone. Heavy lime losses accompanied severe leaching of nitrogen. Such losses can be partially counteracted by the use of calcium nitrate rather than nitrate of soda."

[**Soil and fertilizer investigations in Illinois**] (*Illinois Sta. Rpt. 1930, pp. 10–36, figs. 3*).—The following items are noted:

Soils vary widely in important chemical way.—Base-holding capacity has been shown by E. E. DeTurk, R. H. Bray, and L. K. Eby to vary widely in Illinois soils. Detailed information of this character was found to aid "in determining the crop capacity of various soils, whether or not they will grow different legumes, and their need for liming. . . . Dark-colored soils in the northern part of the State were found to have, in general, about twice as much base-holding capacity as the light-colored soils in the southern part of the State. . . . The lime requirement of a soil depends not only on the proportion of acid to base, but also on the amounts of these base-holding compounds present in the soil."

Still seeking method of coping with "tight clay."—"It has been found [in an investigation conducted by R. S. Smith and E. A. Norton] that tight clay develops only under conditions of poor drainage and represents a mature development. It occurs throughout the State, but only in very small areas in the younger drift sheets. The impervious subsoil found in Vermilion, Ford, Livingston, and adjacent counties is in no way related to tight clay though its effect on agricultural value is similar."

It appeared "that the minerals responsible for the properties of tight clay are the end products of weathering."

[*Soil, fertilizer, and rotation tests.*]—Trials for the most part of the usual type and showing results indicated in the respective captions are reported under the following heads: Grains respond quickly to favorable place in rotations, by E. E. DeTurk, F. M. Wilhite, and O. H. Sears; different soils need different systems of treatment, by F. C. Bauer; cropping system more important than soil treatment, by Bauer; phosphate suggested for wheat on fine sandy loam, by Smith; both livestock and grain systems are soil builders, by Bauer; crop-residue system best treatment for some soils, by Bauer; sandy soils benefited more than others by manure, by Bauer; studies point way to higher profits from limestone, by DeTurk and Bray; and half ton of limestone is worth $10 on some soils, by Bauer.

Further studies put liming on a more scientific basis.—Further studies by DeTurk and Bauer have shown that the sand soils have the least base-holding capacity. "Then follow the light-colored soils of southern Illinois, while the

darker-colored soils of the central and northern portion of the State have the greatest capacity for bases. If these soils were all equally unsaturated, the darker soils listed would be by far the most in need of limestone of any soils in the State. The comparatively less extent to which they have been leached, however, leaves them, on the average, 55 per cent saturated with bases as against only 28 per cent for the southern soils and 36 per cent for the sand. . . . With the satisfaction of 63 to more than 90 per cent of the soil's base capacity has come a correction of nearly all the active acidity of the soil, giving pH values on the limed soils varying but slightly from 7.0, which is the neutral point."

Rock phosphate sometimes worth $10 an acre annually.—The work of Bauer showed the above-indicated increases in crop values and brought out the further fact that "other soils that have not been benefited by rock phosphate have likewise failed to respond to other carriers of phosphorus."

Two forms of phosphorus about equal in long test.—DeTurk and J. C. Anderson found that "rock phosphate has made a better showing than superphosphate on corn, the yields averaging about 7 bu. an acre higher. . . . Equal amounts of phosphorus were applied in the two forms, and in addition gypsum was applied to the rock-phosphate plats in amount equivalent to the gypsum content of the superphosphate." It is noted, however, that "the experiment represents only one soil type, and the results may not apply in full to other types."

Get clue to varying results with rock phosphate.—On slightly acid soils rock phosphate should be applied first when used in conjunction with limestone, according to DeTurk's results, whereas "with highly acid soils, on the other hand, limestone may be necessary before any effective soil improvement program can be carried out. If rock phosphate also is to be used on such soils, the limestone additions should not be excessive."

[*Fertilizer trials.*]—The following captions indicate the more important content of the items covered: Poor crop delays wheat-sweet corn fertilizer study, by DeTurk and Sears; potassium fertilizers worth trying on some soils, by Bauer; and sulfur has little value as fertilizer in Illinois, by Bauer.

Get facts for better use of legumes as green manures.—"Two important factors in the evaluation of legume crops as green manures are the total amount of growth, which furnishes active organic matter, and the amount of nitrogen contained in the crop. There is considerable variation in the growth of the different legumes on different soil types," and to make these differences more definite DeTurk and Bauer "seeded a number of them at various locations and subsequently removed the plants, both tops and roots, for yield determinations and chemical analysis." A graph and table indicate, respectively, the variation in growth and nitrogen production of common white sweetclover on six different soil experiment fields, and the maximum depth of fall root growth of legumes on different soils.

[Soil and fertilizer work in Iowa] (*Iowa Sta. Rpt. 1929, pp. 14, 15, 16–18, 49–51, 58*).—The following are included among the items reported:

The production of artificial manure.—Mixing various chemicals with straw by means of an attachment used with the thresher, together with the application of 400 gal. of water per ton of straw to supplement a rainfall inadequate for satisfactory decomposition, gave a product of good quality.

"Greenhouse tests on the effect of aeration on the decomposition of straw indicated that reworking the compost heap is not necessary to produce a good manure if the straw is uniformly and sufficiently wet. Adco and mixtures of cyanamid were the most efficient reagents tried for stimulating decomposition

and producing the best manure. Preliminary data indicate that straw may be inoculated with fresh horse manure or with soil and the decomposition hastened considerably. Cornstalks have proved satisfactory for the production of artificial manures. In general 1.5 to 2.5 tons of manure, containing 80 per cent moisture, have been made from 1 ton of straw."

Potash benefits "alkali" soils.—"Farmers are finding that potash applied to these alkali spots which have been drained and treated with organic materials will aid crop growth materially. In an experiment in Kossuth County in 1926, the corn on the untreated plat yielded 55.4 bu. per acre while on the muriate of potash treated plat is yielded 62.8 bu. per acre. The muriate was applied at the rate of 200 lbs. per acre." Further similar data are given.

Soil experiment fields.—From nearly 100 soil plat series in about 50 counties are reported representative cases of the actual yield increases of alfalfa from treatment, the value of the increase, the cost of the fertilizer, and the profit from the use of fertilizer.

Humus investigations.—In an examination into the effect of soil molds on rock phosphate availability, various species have been grown in pure culture, both in soil and in solutions, and the water-soluble phosphate determined. All cultures made considerable growth and it was thought perhaps that even the heaviest feeders of phosphorus probably found enough in solution for maximum growth and that the assimilated phosphorus was not determined by this method. Accordingly, two other methods were tried. "In one method the cultures were dialyzed and the phosphorus in the acid dialyzate determined, and in the other method the phosphorus content of the mycelial growth of the cultures was determined. A combination of the two latter methods is rather promising."

In preliminary trials, "the relative values of colloidal phosphate and other phosphate fertilizers were determined in pot culture tests with wheat on Tama silt loam in the greenhouse. Significant differences were obtained in the growth of the wheat with colloidal phosphate, superphosphate, and rock phosphate in favor of the colloidal phosphate when it was applied at the rate of 1,000 lbs. per acre, rock phosphate at 1,000 lbs. per acre, and superphosphate at the rate of 150 lbs. per acre."

Chemical and bacteriological effects of liming and legume inoculation in the southern Iowa loess soil area.—"The data indicate quite definitely that the outstanding need for increased nitrification in this soil (Grundy silt loam) is the addition of lime. If the nitrifying power of the soil is a measure of fertility, which seems quite probable from considerable experimental work, then lime is certainly the treatment most needed for better crop growth on this soil."

[Soil investigations of the Kansas Station] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 23–28*).—The following form a part of the data not previously noted:

Plant nutrition investigations.—An acid soil, Cherokee silt loam, was given various treatments including lime, phosphatic fertilizers, and potassium, and was cropped to alfalfa in the greenhouse. "Analysis of the 1929 crop indicates an increase in calcium in the hay as a result of liming and a material increase in phosphorus where both lime and phosphorus were applied. It is significant that with increased rates of liming more phosphorus was required to show an increase in this element."

The influence of legumes and free living organisms on the growth of plants and on the nitrogen balance of Kansas soils.—"In 1928, which was a good corn year, a preceding crop of alfalfa and sweetclover for one year increased the yield of corn 16 bu. per acre compared with no legume. Soybeans increased the yield of corn 14 bu. In 1929, a dry season for corn, the legumes did

not increase the yields of the corn. The oat crop in 1929 was the first one preceded by legumes. In that season, a preceding crop of sweetclover produced a much better crop than did soybeans, the average difference for two plats of each being 18.8 bu."

Of the results of the study of the soil nitrogen, it is stated that very large losses of nitrogen have taken place, the major factor seeming to have been the original nitrogen content of the soil. A correlation coefficient of 0.64±0.04 was found between the original nitrogen content and losses taking place for the entire 99 plats. "Continuous small grain or alternate small grain and fallow seemed to result in the smallest loss of any cropping system tested. Three years of fallow and one of cropping produced heavy losses. Sorghums, either continuous or alternating with fallow, caused relatively large losses of nitrogen. The various rotations examined were intermediate between the small grain and sorghums in this respect. Losses were very high where stable manure was applied. With low original nitrogen contents, no losses have taken place under small grain, some evidence of gains being noted. . . . There are indications that when the nitrogen content of the soil of this region falls to approximately 0.1 per cent, the factors responsible for additions of nitrogen to the soil counterbalance those tending to cause its removal, thereby establishing a nitrogen equilibrium near this level. The very important question is raised whether at such a low nitrogen level the soil will be able to supply an adequate quantity of soluble nitrogen to enable the most efficient utilization of the available moisture."

A study of the soil solution as governed by H-ion concentration.—The study of the zeolitic exchange in soils (E. S. R., 61, p. 114) has been continued in a direction similar to that previously indicated. The colloidal fraction of six Kansas soils was isolated by repeated washing with normal sodium chloride solution until no traces of calcium were present in the supernatant liquid. Excess electrolyte was then removed by washing with water until the finer particles remained in suspension. Portions of the colloidal exchange complex as isolated from the six soils were treated with aqueous solutions of the chlorides of iron (ferric), aluminum, calcium, magnesium, sodium, potassium, ammonium, and hydrogen. They were then freed from excess electrolyte by washing and then air dried. "It was found that the soils treated with the tribasic bases could be thoroughly washed by water, those treated with dibasic bases by washing with alcohol, while those treated with monobasic bases could not easily be entirely freed from excess electrolyte. . . .

"The colloid complex from the Derby silt loam was dried to constant weight over sulfuric acid and suspended in water at a 1 to 2.5 ratio. . . . Under controlled conditions of temperature and humidity absolute equilibrium was not reached in a period of five months. The results, among other things, indicate an extremely unstable condition of the soil." Various other experimental data and conclusions are recorded.

A study of replaceable cations and anions in some Kansas soils.—The work has been devoted principally to water-soluble phosphorus. So little phosphorus was found to be brought into solution by ammonium sulfate that this phase of the subject was discontinued. "Replaceable (or soluble) phosphorus in Cherokee silt loam with various fertilizer treatments was determined and the work repeated with Cherokee silt loam which had been treated with calcium to replace the other bases. Soluble phosphorus was also determined in Cherokee silt loam with varying amounts of lime and fertilizer treatments. The results . . . indicate that when the other bases in the soil are replaced by calcium the solubility of phosphorus is somewhat increased."

[Soil Survey Reports, 1925 Series] *(U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1925, Nos. 32, pp. 28, fig. 1, map 1; 33, pp. 62, pls. 2, fig. 1, maps 2).*—Surveys Nos. 32 and 33 were carried out with the respective cooperation of the Department of Conservation and Development of New Jersey and the Oregon Experiment Station.

No. 32. *Soil survey of the Bergen area, New Jersey,* L. L. Lee et al.—The Bergen area includes 409,600 acres in the northeastern part of the State, lies almost entirely within the glaciated region, and is for the most part adequately drained "by several large streams and rivers flowing in a general southerly direction."

Of 26 soil types representative of 13 series, Wethersfield loam, 7.2 per cent of the entire area, is the most extensive here mapped and classified. City land, unclassified because it is "used entirely as building sites and is so densely populated that determination of the various soil types is not practical," occupies 22.1 per cent, and less extensive areas not classified in this report consist of clay pits, rough stony land (9 per cent), swamp, tidal marsh (7.6 per cent), made land, and meadow.

No. 33. *Soil survey of the Eugene area, Oregon,* E. J. Carpenter et al.—The Eugene area, Oregon, forms a part of Lane County, in the west-central part of the State and includes 830,720 acres, of which a large section "is located in remote mountainous districts of unappropriated Government land." The topography is indicated by the presence of 43.8 per cent of rough mountainous land as the important unclassified material. Drainage was found generally good.

The classified soils here mapped and described constitute 38 types belonging to 21 series, of which 9 per cent is Melbourne clay loam and 8.6 per cent Olympic clay loam. The minor unclassified areas consist of 0.5 per cent each of rough, broken, stony land and of river wash.

[Soil Survey Reports, 1927 Series] *(U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1927, Nos. 5, pp. 28, fig. 1, map 1; 6, pp. 33, pl. 1, fig. 1, map 1; 7, pp. 24, pl. 1, fig. 1, map 1; No. 8, pp. 28, figs. 2, map 1).*—Reports Nos. 5, 7, and 8 were prepared with the cooperation, respectively, of the North Carolina Department of Agriculture and the State Experiment Station; of the Georgia State College of Agriculture. and the University of Nebraska.

No. 5. *Soil survey of Davie County, North Carolina,* R. C. Jurney and S. R. Bacon.—Davie County consists of 165,120 acres of a rather high, considerably dissected plateau, located in west-central North Carolina, and characterized by a drainage system ranging from inadequate, with need of ditches, to a flow sufficiently excessive to cause erosion and run-off damage.

The soils consist of 9 series including 13 types, Cecil clay loam, Iredell loam, and Davidson clay loam taking up the greater areas with 26.0, 19.3, and 13.0 per cent, respectively, of the area dealt with in this survey.

No. 6. *Soil survey of Orange County, Virginia,* B. H. Hendrickson.—Orange County is an area in north-central Virginia of 197,760 acres of rolling to hilly land, crossed by a low mountain ridge, adequately drained, but, with the inclusion of pastures, only about 40 per cent cultivated. The county is here divided into 22 soil types assigned to 16 series. Nason silt loam amounts to 32.9 per cent of the county, and Davidson clay loam follows with 20.2 per cent.

No. 7. *Soil survey of Clarke County, Georgia,* G. L. Fuller.—Clarke County is an area of 73,600 acres "of an eroded and dissected remnant of an old plateau" in northeast Georgia, and has a drainage "so excessive that check-

ing surface run-off to prevent excessive erosion is a problem of great importance" in the greater part of the area.

Seven series of 9 types were mapped, the most extensive classified type being Cecil sandy loam, which, with the inclusion of a very large mixed phase, constitutes 40.2 per cent of the county. Cecil clay loam follows with 35.6 per cent of the county, and 4.5 per cent of unclassified meadow is also listed.

No. 8. *Soil survey of Clay County, Nebraska*, R. C. Roberts and B. Gemmell.—Clay County, Nebraska, has a land area of 365,440 acres in the loess plains region, in the southeastern part of the State, and is for the most part well drained.

A group of 11 soil series, each represented by a single type, constitute the classified soils, unclassified material being represented only by but 0.3 per cent of rough stony land. Crete silt loam, practically entirely under cultivation, leads in areal extent with 52.9 per cent of the total area surveyed, and is followed by Hastings silt loam, also a highly productive soil, with 24.5 per cent.

Soil survey of Watauga County, North Carolina, W. A. Davis et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1928, No. 1, pp. 14, fig. 1, map 1*).—Watauga County is an area of 200,960 acres in the Blue Ridge Plateau region, lies in northwest North Carolina, and consists of a series of valleys separated by the mountain ridges.

Ashe loam constitutes 41.9 per cent, Porters loam 25.0 per cent, and Ashe stony loam 10.2 per cent of the county. A total of 8 types of 4 series was mapped, as well as rock outcrop and rough stony land, which form 3.7 per cent of the area. It is further stated that "most of the stony soils [3 out of 8 types] are suited only for forestry."

The report was prepared in cooperation with the North Carolina Department of Agriculture and the State Experiment Station.

Chemical composition of the soils of McHenry County, T. H. Hopper and H. L. Walster (*North Dakota Sta. Bul. 240 (1930), pp. 46, fig. 1*).—Supplementing the soil survey of McHenry County (E. S. R., 53, p. 417), the bulletin here noted presents by series and by types the chemical composition of the soils of the county with respect to nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, silicon, organic carbon, carbonate carbon, the calcium-magnesium and carbon-nitrogen ratios and the lime equivalents in the surface soil (0 to 7 in.), the subsurface soil (7 to 20 in.), and the subsoil (20 to 40 in.). The following are among the more general statements made on the basis of the analytical information:

In the case of the Barnes series of soils, the most important in the county, the average composition approximates the composite composition of the soils of the county. "The widest divergence is in the case of the carbonate carbon in the surface layer, which is considerably below the composite value. Barnes loam approximates the composite composition about as closely as any soil type in the county. The entire profile of the LaMoure soils are higher in nitrogen, phosphorus, and organic carbon than the Barnes. The low lying and flood plain soils, LaMoure, Fargo, Cass, and Maple, usually have nitrogen and phosphorus percentages above the average in the surface layer. Peat and muck is the highest in these two elements. The sandy and gravelly soils, Sioux, Valentine, Pierce, and dunesand are generally low in nitrogen and phosphorus. The Rogers series averages highest in percentage of potassium in the surface soil and peat and muck the lowest. The more important and valuable soils, Barnes and LaMoure, contain calcium in percentages increasing with depth, but those

which are in situations where they receive leachings from other soils, particularly Cass, Rogers, Gannett, Maple, and peat and muck, generally have higher concentrations of calcium in the surface soil than in the subsoil. The occurrence of magnesium is in somewhat the same order as calcium, and only in isolated instances is the percentage as high as that of calcium. None of the soils of McHenry County contained extreme percentages of sulfur. Only the low lying alkaline Rogers soils, particularly Rogers clay loam, were high. This clay loam contained 0.72 per cent of sulfur in the surface layer. The silicon contents were low in the soils containing a high percentage of organic carbon or carbonate carbon or both. Those of a more sandy nature were high in silicon."

The lime carbonate content did not seem to indicate "any immediate development of a soil acidity problem."

Organic compounds associated with base exchange reactions in soils, W. T. McGeorge (*Arizona Sta. Tech. Bul. 31 (1931), pp. 215–251, figs. 7*).—Continuing previous work (E. S. R., 63, p. 619), the exchange capacity of the lignin content of soils was found to vary in different soils; and "the same is true for 'ligno-humates,' although the range of variation is not so great. The aqueous-alkali-soluble ligno-humate has a much higher exchange capacity than the alcoholic-alkali-soluble lignin. The average for the former, in ten soils, is 382 M. E. [milliequivalent] and the latter 116 M. E. per 100 gm. Leaching the lignin and ligno-humate with hydrochloric acid increases the exchange capacity, probably by hydrolysis. The quantity of lignin extracted from soils by alcoholic alkali represents a comparatively small percentage of that actually present. Maximum solubility may be obtained by digesting with aqueous alkali at increased pressures. Titration of lignic acid (hydrogen-saturated lignin) and ligno-humic acid (hydrogen-saturated ligno-humate) with potassium hydroxide and barium hydroxide indicates that the lignin molecule is dibasic and ligno-humate tetrabasic. The absorption of the base of an acetate by lignin is equal to that required as hydroxide to neutralize the hydrogen-saturated salt. . . . The sodium and potassium organic complexes show rather high ionization, while those of calcium, barium, and hydrogen are very low. . . .

"The influence of a common ion upon replacement by another base is appreciable, but, except for calcium, it is less outstanding than in inorganic zeolites. Xylan exhibits, to a slight degree, the property of base replacement, but this is not of sufficient magnitude to account for the greater exchange capacity of the ligno-humate as compared with lignin. Synthetic humus, prepared from xylan or cellulose, like that prepared from sucrose, yielded materials with rather high base exchange capacities. Xylan, lignin, and ligno-humate absorbed color from basic fuchsine solution, and this color was replaceable by the base of a neutral salt solution. Green manure (ground dry alfalfa) shows an appreciable base exchange capacity, a large part of which is not easily destroyed by digestion with H_2O_2. The base exchange capacity of ground alfalfa was increased fourfold by spontaneous decomposition"; and, as was found to be the case with soils, the extraction of ground alfalfa with alcoholic or aqueous sodium hydroxide yielded a lignin of high base exchange capacity.

"The lignin content of organic matter and highly organic soils is a linear function of the base exchange capacity, while there is no relationship between hemicellulose or cellulose and the exchange capacity."

[Bacteriological investigations, Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 27, 48, 49*).—The following are reported among other items:

Fermentation of certain carbohydrates with the isolation and utilization of the fermentation products.—Propionic acid, which, it is noted, would probably,

if produced commercially, "replace acetic acid as an organic solvent," is reported to have been produced experimentally "by bacteria which have received little study, known as 'propionic bacteria.' They produce largely propionic and acetic acids from carbohydrate material. The production of acetic acid is also being investigated. This process is known as a thermophilic fermentation and takes place at 149° F. (65° C.). Corncobs have proved more satisfactory than the stalk. At present no one species of bacterium has been isolated which produces as much acetic acid as mixed cultures."

Studies on Rhizobium leguminosarum.—Fermentation characteristics as an index of physiological differences among strains within a group and "for differentiating the cross-inoculation groups," were investigated. "In these studies the soybean organisms generally produced an alkaline reaction in the various media tested, and the alfalfa group of organisms produced an acid reaction. However, different strains of the same organism differ so widely in their ability to produce either acid or alkali that it is doubtful whether a definite statement should be made in regard to their fermentative characters.

"The results show further that the ability of any one strain of organisms to produce acid or alkali from a certain sugar is fairly constant. Repeated tests on the same medium have given practically the same results every time. In other words, a particular strain of organism that was a strong acid producer in one test, for example, was a strong acid producer in all later tests. . . .

"Tests for the fixation of nitrogen by cultures of Rhizobium from soybeans and alfalfa in the absence of the host plant have been conducted on media containing the following sources of energy: Mannitol, lactose, dextrose, galactose, maltose, glycerol, sucrose, soluble starch, and sodium citrate. Small amounts of nitrogen as peptone or yeast water were added in some of the tests with mannitol. In none of the tests was an appreciable quantity of nitrogen fixed. Attempts to count the numbers of *R. japonicum* by plating on nitrogen-free media have been made. Lactose, sucrose, dextrose, maltose, and mannitol agars have been used. Yeast mannitol agar has been tried also, but it has not been found possible to differentiate between the *R. japonicum* and certain other bacterial colonies appearing on the plates."

The microflora of a rich sulphate-containing soil, J. D. Greaves (*Jour. Agr. Research [U. S.], 42 (1931), No. 3, pp. 183–186*).—The present contribution from the Utah Experiment Station extends previous work on the flora and productivity of alkali soils, leached and unleached, naturally saline, and artificially salt (E. S. R., 57, p. 713; 63, p. 213; 64, p 17).

The subject of the experiments here noted was a naturally saline soil "extremely rich in sulfates" but containing only small proportions of other salts. "Areas within the district from which the soil was obtained were so high in soluble salts, mainly sodium sulfate, that only a few alkali-tolerant plants grew upon it. However, the surrounding soil, which contains only a low salt content, is highly productive. The samples were taken from the 'alkali spots.' Ten-kilogram portions were leached for two years. Ninety liters of water passed through the soil, which, in addition to small quantities of other salts, removed 67.8 gm. of sodium sulfate and 12.7 gm. of sodium chloride.

"After the soil was leached one crop of crimson clover and two crops of barley were grown on it. However, the yields in all cases were only slightly greater on the leached than on the unleached soil. The soil was sampled after each crop and its ammonifying, nitrifying, and nitrogen-fixing powers determined. The leaching of the soil greatly increased the number and activity of the microorganisms within it. Its nitrogen-fixing powers were very active, for when kept

in pots in the greenhouse with optimum moisture and nearly optimum temperature for a period of three years it gained nitrogen at the rate 1,142 lbs. per acre-foot of soil."

Under the head, cultural characteristics of the organisms, the morphology and the physiological idiosyncrasies of the fungi and of the bacteria isolated are briefly summarized individually for each of 16 cultures. A table summarizes culture reaction of 21 forms.

"Fifteen of the organisms fixed nitrogen when grown in soil to which 1 per cent of mannite had been added. The quantity fixed varied from 1.4 to 7 mg. in 100 gm. of soil. Three fixed over 4 mg., and these are probably the organisms, or at least among the organisms, which are causing this soil to gain nitrogen. Two of the organisms decomposed cellulose and one liberated ammonia from urea."

A study of factors influencing inoculation experiments with Azotobacter. P. L. Gainey (*Kansas Sta. Tech. Bul. 26 (1930), pp. 66*).—The natural distribution of Azotobacter was found "very closely associated with, if not dependent upon, the absolute reaction of the soil." It was further observed that when bacteria of this genus "are introduced into cultivated acid soils with a pH of less than 6.0 they soon perish, the rapidity of this disappearance depending upon the degree of acidity.

"The addition of basic substances such as $CaCO_3$, $MgCO_3$ or neutral or basic soil in sufficient quantities to reduce the H^+ concentration to less than 10^{-6} will render acid soils a fit pabulum for the existence of Azotobacter. The addition of sufficient quantities of acid to a soil containing Azotobacter to maintain permanently a H^+ concentration greater than 1×10^{-6} in the soil solution will result in the disappearance of Azotobacter therefrom. The maximum H^+ concentration in the soil solution compatible with the existence therein of an active Azotobacter flora is very near 1×10^{-6}. The major factor controlling the existence of Azotobacter in soils, at least as so far determined, is the hydrogen-ion concentration of the soil solution, the hydrogen ions apparently acting directly as a toxic agent, though there is a possibility that they may act indirectly by affecting some other soil constituent."

Soil nitrates as a guide to the nitrogen needs of vegetable crops, H. D. Brown (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 55–58*).—The technic of Morgan, noted on page 805, for the estimation of nitrate nitrogen in soils by means of the diphenylamine reaction was used for the work indicated during the 1930 season. "Tests made during the spring and early summer indicated that the tomato and cucumber crops growing in supposedly rich soils in our university greenhouses were starving for nitrogen. In many instances the nitrate-nitrogen content was reduced as low as 1 to 7 p. p. m. The color of the foliage and shape of cucumber fruits also indicated lack of nitrogen. Evidently nitrogen is not liberated from so-called rich greenhouse soils fast enough for spring and summer cucumber and tomato production. . . .

"In spite of the fact that the dry soil was in many instances only a few inches from moist areas it was found that the dry soils often contained 20 or more p. p. m. of nitrate nitrogen. This difference is thought to be due largely to the removal of the nitrates from the moist soil by plant roots, as an excess of water was not used and so little could have been lost by leaching. During the fall and winter, on the other hand, the nitrate content of soil and plants was always high; i. e., 20 p. p. m. or more. . . . It is estimated that 7 p. p. m. of nitrates are sufficient for cucumbers and tomatoes and 15 p. p. m. for leafy vegetables in the fall, but that 20 or more p. p. m. should be supplied in the spring and summer.

"The nitrate content of fresh strawy manure was tested many times and seldom found in excess of 5 to 7 p. p. m. The utilization of the excess soil nitrates by fall applications of strawy manure is, therefore, suggested as a possible means of reducing the nitrate supply of rich greenhouse soils during the fall and winter." Related experiments upon greenhouse and other crops and soils are noted, and it is pointed out that "it is obvious from the foregoing that the quickly made diphenylamine test for nitrates has great value."

The use of manganese in vegetable greenhouses, I. C. HOFFMAN (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 58–62, figs. 4*).—Results similar to those of the original work on manganese at the Rhode Island Station (E. S. R., 54, p. 450) are reported, illustrated by photographs of the chlorosis produced by lack of sufficient manganese as the condition appears in tomato leaves and in cucumber leaves. "In each case described in this paper the trouble was corrected by a single application [100 to 150 lbs. per acre of manganese sulfate], and the growers estimated increased yields at 10 to 25 per cent over untreated sections."

Inspection and analysis of commercial fertilizers, spring, 1930, L. D. HAIGH (*Missouri Sta. Bul. 292 (1930), pp. 12*).—The usual analyses and brief comment are presented.

AGRICULTURAL BOTANY

Freezing-point depression and specific conductivity of sorghum tissue fluids, J. H. MARTIN, J. A. HARRIS, and I. D. JONES (*Jour. Agr. Research [U. S.], 42 (1931), No. 2, pp. 57–69*).—Using sorghum as plant material because of its outstanding drought qualities, studies were undertaken to determine differences that might exist in tissue-fluid properties of different varieties under different conditions and the changes that take place in these properties.

The freezing-point depression was greatest in the juices of the terminal leaf of sorghums, with a progressive decrease in the leaf juices from the top of the plant downward. For juices of the internodes the freezing-point depression was about the same in all parts of the plant at the flowering stage but increased from the top down to the fourth internode as the plant approached maturity.

The juices of tillers and branches of sorghums had less freezing-point depression and a lower conductivity than those of the main stalks. Sorghum-leaf juices, except broomcorn, had less freezing-point depression and a lower conductivity than corn. Sorghum-stalk juices usually had a greater freezing-point depression than those of corn. The average conductivity of sorghum-stalk juices was about the same as that of corn. There was little change in either freezing-point depression or conductivity of leaf juices as the plants approached maturity. Water deficiency did not apparently cause an increase in the freezing-point depression or conductivity of the leaf and stalk juices in sorghum, but may do so in corn if the plants reach the wilting stage. Definite indications were not found of the existence of bound water in sorghum juices.

The crowns and roots of sorghums had a higher osmotic concentration but lower conductivity than those of corn, the difference in osmotic concentration accounting perhaps in part for the greater drought resistance of sorghums.

A study of drought resistance of plants (*Kansas Sta. Bien. Rpt. 1929–30, pp. 48–50*).—Determinations of the draft that various crop plants and weeds make on soil water were made by growing plants in cans and measuring the loss in weight in relation to leaf area. The wild sunflower, Russian sunflower,

cocklebur, ragweed, smartweed, and lamb's-quarters showed a higher transpiration rate than any of the crop plants tested. The wild sunflower led with rates of 2.08, 1.92, 2.3, and 4.4 times that of Dwarf Yellow milo, corn, cowpeas, and soybeans, respectively. Velvetweed showed the lowest transpiration rate of any of the plants, except the soybean.

Measurements by means of the electric thermocouple showed that the internal temperature of milo leaves is 31.4° C. when that of the air is 30.3°, and that of wilted milo leaves is 32.9° with air at 29.9°. The internal temperature of cabbage leaves was 32.3° when the air was 31.6°. In turgid cowpea leaves the internal temperature was 31.5° with the air temperature at 28.1°. In wilted cowpea leaves the internal temperature was 34° with air at 29.2°. Upper surface temperatures were approximately 1° higher than those of the interior in the case of the milo and cabbage leaves, and about 1° lower in the case of cowpea leaves.

The part played by vitamins in green plants [trans. title], N. BEZSSONOFF (*Rev. Path. Vég. et Ent. Agr., 14 (1927), No. 2, pp. 142–155*).—An exposition, largely bibliographical, of the supposed part played by vitamin A in the photosynthesis of chlorophyll, concludes in part that vitamin A is a reducing substance, and that most of the reactions characterizing photosynthesis are reductions.

Biological studies of pollens [trans. title], M. QUADRIO (*Riv. Biol., 10 (1928), No. 5–6, pp. 708–726*).—Information resulting from a study of pollens of 183 plants listed is given in descriptive form, and the contents as regards amids, sugar, and fat are tabulated.

Criteria of male and female in bread moulds (Mucors), S. SATINA and A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 15 (1929), No. 9, pp. 735–740, figs. 3*).—Qualitative and quantitative tests, some of which have been noted (E. S. R., 59, p. 620), indicate that the (+) races of Mucors react biochemically as do the females of higher plants, and the (−) races like the males. Evidence from these tests, suggesting that this (+) sex is female and this (−) sex male, is in line with evidence from imperfect hybridization reactions with all species except one of the heterogamic hermaphrodites. Until further evidence is available, certainty will not be possible as regards such homologies. Tentatively, for convenience, the (+) and the (−) races are designated respectively as female and male.

GENETICS

Genetics of cotton: A survey of our present knowledge, T. H. KEARNEY (*Jour. Heredity, 21 (1930), Nos. 7, pp. 325–336, figs. 6; 8, pp. 375–384, figs. 4; 9, pp. 409–415, fig. 1*).—The data on the characters of the cotton plant for which evidence of monohybrid or dihybrid inheritance has been presented are summarized with a list of 50 references.

On the moment of Mendelian segregation in Epilobium hirsutum [trans. title], J. PRZYBOROWSKI (*Acta Soc. Bot. Polon., 4 (1927), No. 2, pp. 114–124, pl. 1; Eng. abs., pp. 119–123*).—The assumption, based on analogies, regarding the association of the segregation of Mendelian factors with the reduction division, though confirmed in some cases was so sustained only in the case of the lower orders of plants. The hypotheses and reasonings are outlined.

The problem regarding the moment of segregation in higher plants was undertaken with *E. hirsutum*, which is said to show two hereditary forms of hirsuteness.

"Thus having received by pollinating a recessive with a single pollen tetrad of a heterozygote, in each case both prevalent and recessive type, I am author-

ized to conclude that the spoken of factor in *E. hirsutum* does segregate in one of both divisions of the pollen mother cell."

Xenia and metaxenia in apples, B. R. Nebel (*New York State Sta. Tech. Bul. 170 (1930), pp. 16, figs. 5*).—Careful measurements of the fruit obtained from controlled crosses of Fameuse × Yellow Bellflower and Fameuse × McIntosh showed more and significantly larger seeds per apple in the Yellow Bellflower cross. The curve for the length of seed frequency was somewhat bimodal in the case of the Yellow Bellflower and distinctly unimodal in the McIntosh cross. The breadth of the fruits of Fameuse × McIntosh was consistently less variable than that of Fameuse × Yellow Bellflower fruits. The height of fruit was somewhat greater in the Yellow Bellflower cross. The factor obtained by dividing breadth by height was slightly smaller in the Yellow Bellflower cross. No correlation was obtained between average seed length and length or breadth of the fruit. The genetic aspects of the results are discussed in considerable detail.

Studies in animal reproduction and inheritance (*Kansas Sta. Bien. Rpt. 1929–30, pp. 94–96*).—Studies in animal reproduction and inheritance with guinea pigs and rabbits have been conducted, mainly of characters having economic importance, and largely from a show-type standpoint.

In studies with guinea pigs it was found that the width of the white marking in the face was hereditary. Cherry-red individuals crossed with extremely light reds produced somewhat intermediate crossbreds, but they resembled the cherry-red parent to a greater degree.

Another factor (*li*) has been found to be responsible for the production of animals which are cream at birth. When the factors *f* and *li* are combined in the homozygous condition there is produced a very light cream, which is a desirable show color.

The operation of a modifying factor for long hair which localizes the areas for its production was found in guinea pigs.

It appears that the "Roman nose" character, desirable for show purposes, is due to the operation of one or more dominant factors. The operation of a recessive Mendelian character causing "waltzing" in guinea pigs was also noted. Progress is also reported in the inbreeding study with guinea pigs.

Interesting results were being obtained on the inheritance of a characteristic described as bad temper in rabbits.

Studies in the inheritance of the grouse locust (*Kansas Sta. Bien. Rpt. 1929–30, pp. 96, 97*).—Continuing studies on the inheritance of factors in the grouse locust (E. S. R., 61, p. 123), the discovery of a lethal factor in *Apotettix eurycephalus* has been noted which seems to be located on the same chromosome as other color patterns, and is the first characteristic outside of color patterns to be determined in this species. Chromosome studies have indicated that parthenogenetically-produced individuals may be distinguished from sexually-produced grouse locusts.

X-raying resulted in heavy mortality, and a new color pattern in *A. eurycephalus* was produced.

Earlessness in Karakul sheep, J. L. Lush (*Jour. Heredity, 21 (1930), No. 3, pp. 107–112, figs. 6*).—Further data are presented from the Texas Experiment Station on the inheritance of the long- and short-ear and earless character in sheep. In the Karakul flock there were produced 15 long-eared, 29 short-eared, and 6 earless offspring from different types of matings. This, it was concluded from analysis of these data, agreed with the hypothesis previously advanced by Ritzman (E. S. R., 45, p. 170) that the long-ear character was dominant and earless recessive, while the short-eared type represented the heterozygote.

"Parted parietals" in mice, C. E. Keeler (*Jour. Heredity, 21 (1930), No. 1, pp. 19, 20, figs. 2*).—A condition is described in mice in which the parietal bones are parted and a blood vessel passes through them. This condition was inherited as a dominant factor.

[Genetic experiments with poultry at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 85–87*).—The results are given of studies of the inheritance of plumage characteristics.

Inheritance of standard characteristics in poultry.—In addition to the results of studies previously noted (E. S. R., 62, p. 421), it was found that the tendency to crooked or straight keel bones in fowls is hereditary. Strains were produced which differed strikingly in the occurrence of deformed breast bones.

In another study dealing with the inheritance of salmon breast in White Leghorns it was found that this characteristic appeared only in females, the expression of salmon breast in males being exhibited as red in the wing bow. A single major autosomal factor appeared to be responsible for the character.

Inheritance of breed characteristics in poultry.—Crosses of males heterozygous for five characters with Rhode Island Red females carrying recessive members of these characters indicated no linkage between them. There was indication of loose linkage between pea comb and feathered legs, but it appears that more data are required before these results may be generally accepted.

Inheritance of egg production in Single Comb Rhode Island Reds.—By selection for early-maturing and late-maturing strains of Rhode Island Reds, strains were produced which differed by about 46 days in the average age at maturity.

Crossbred poultry, D. C. Warren (*Kansas Sta. Bul. 252 (1930), pp. 54, figs. 21*).—A report is given of the results of the crossbreeding studies with poultry which have been in progress for a number of years.

In a cross of Single Comb White Leghorns with Jersey Black Giants (E. S. R., 58, p. 629) the hybrids proved superior to the parental breeds in all the criteria of vigor employed.

In the cross of Single Comb White Leghorns and Single Comb Rhode Island Reds (E. S. R., 62, p. 215) the hybrids were likewise superior in most of the comparisons, but appeared inferior in their tendency toward broodiness. The egg color was intermediate. Up to 8 weeks of age the hybrid chicks were larger, but after 8 weeks the Rhode Island Reds excelled the hybrids in size.

In another series of tests data were obtained on chick mortality and rate of growth up to 10 weeks of age on Single Comb White Leghorns, Single Comb Rhode Island Reds, and Barred Plymouth Rocks, as well as the reciprocal crosses between them. These results also showed that the hybrids generally excelled the parent breeds in these two characteristics, although there was some variability at different ages.

In a study of the effect of crossing two strains of the same breed, strains of Single Comb White Leghorns from Kansas and from the West Coast were crossed. The stimulation from crossing was not as apparent as when breeds were crossed. The hybrids from the West Coast strain male and the Kansas strain females showed the best hatchability and egg production, but the West Coast strain had the lowest chick mortality, and weight at 8 weeks of age was equal to that of the best hybrid group.

In connection with the sex-linked inheritance of the rate of feathering (E. S. R., 53, p. 427), it was found that birds carrying the factor for early feathering could be identified at hatching by the growth of the primary and secondary wing feathers. While the rate-of-feathering factor for sex determination is not quite as accurate as color, it permits the use of White Leghorns

in crosses with a considerable number of breeds, and produces a white, relatively uniform flock.

Genetic studies in poultry.—VIII. On a case of sex-linkage within a breed, R. C. PUNNETT and M. S. PEASE (*Jour. Genetics, 22 (1930), No. 3, pp. 395–397, pl. 1*).—In continuing this series (E. S. R., 62, p. 725), fowls were produced by crossing and back-crossing Barred Plymouth Rocks and Gold Campines, with selection, so that a synthetic breed produced carried both dominant and recessive barring. Birds of both sexes heterozygous for dominant barring were mated and produced chicks showing the following down characteristics: 31 females with normal Campine down, 53 males and females with Campine down and light head patching, and 24 males with pale "blotchy" down. As it was possible to distinguish birds having one or two doses of *B*, the sex could be determined at hatching by the down character of the chicks.

The quantitative theory of sex and the genetic character of haploid males, W. E. CASTLE (*Natl. Acad. Sci. Proc., 16 (1930), No. 12, pp. 783–791, figs. 4*).—A hypothesis for sex determination is presented to correlate various theories which have been proposed from studies of moths, Drosophila, Lebistes, and other animals and plants. It is suggested that the X chromosome has a female sex tendency, while the Y chromosome has a neuter tendency. In Drosophila and mammals X is weak as compared with Y, and 2X>Y; whereas in birds and moths X is relatively strong and X>Y. The behavior of the sex-determining chromosomes in different species is reviewed, and it is pointed out that the theoretical haploid male would be expected from the weak X type. Such individuals would be genotypically females but functionally sperm producers.

Referring to the WZ type of sex inheritance, X is used for W, and Y for Z for purposes of simplicity.

A double sex reversal in a hen, R. A. MCCANCE and A. WALTON (*Jour. Heredity, 21 (1930), No. 3, pp. 130, 131, fig. 1*).—An account is given of a light Sussex hen which laid eggs, later developed male plumage and spurs, and finally hatched chicks and laid eggs.

A statistical study of the relation between various expressions of fertility and vigor in the guinea pig, G. HAINES (*Jour. Agr. Research [U. S.], 42 (1931), No. 3, pp. 123–164, figs. 18*).—From a study of the records of more than 30,000 guinea pigs in the colony of the Animal Husbandry Division, Bureau of Animal Industry, U. S. D. A., over an 18-year period, correction factors for the influence of the size of litter and sex on birth weights, weaning weights, percentage of young born alive, and percentage raised of those born alive were established. Corrected indices for the individual months over this period were calculated for frequency of litter, size of litter, birth weights, gains to weaning, percentages of young born alive, percentage raised of those born alive, sex ratio, and young raised per 100 matings, and from the correlation between them it was estimated that the different indices were probably affected by different environmental influences which were closely associated.

From these correlations it was estimated that the reaction of these indices to exceptional conditions would be expected to manifest themselves first in birth weight, followed in 7 days by percentage of young born alive, in 13 days by gain, in 28 days by percentage raised of those born alive, in 33 days by frequency of litter, and in 43 days by size of litter. From these values it was estimated that the major influences on the different indices occurred at or before the following stages of gestation: Size of litter 10 days before conception, frequency of litter at conception, percentage of young born alive at the

twenty-sixth day of gestation, birth weight at the thirty-third day, percentage raised of those born alive at the thirty-eighth day, and gain at the fifty-third day of gestation. There appeared to be a small but regular negative association between the percentage of males in the stock and the expression of the other indices.

Relationship between vitamin C and some phases of reproduction in the guinea pig, M. GOETTSCH (*Amer. Jour. Physiol., 95 (1930), No. 1, pp. 64–70, fig. 1*).—In studies in which guinea pigs received scorbutic diets it was found that there was a considerable loss in weight at oestrum, but that oestrum continued quite regularly. Motile sperm, which were found by artificial insemination to be functional, were present in the epididymis of male guinea pigs dying of chronic scurvy. Males, however, on the scorbutic diet were unable to sire litters. Supplying such males with vitamin C restored their power to sire litters.

The hormonal control of lactation.—I, Non-effect of the corpus luteum. II, Positive action of extracts of the hypophysis, G. W. CORNER (*Amer. Jour. Physiol., 95 (1930), No. 1, pp. 43–55*).—In a series of experiments with rabbits it was found that the administration of corpus luteum extract alone to spayed animals or the continuous presence of corpora lutea for a period equivalent to normal gestation did not induce proliferation of the mammary gland beyond that normally observed at puberty.

In other experiments the daily administration of an alkaline extract of sheep hypophysis corresponding to about 0.5 gm. of the fresh tissue to mature does, in which corpora lutea had been produced by mating with vasectomized bucks, brought about lactation within a few days. It was at first thought necessary that the animals have corpora lutea present within a few months to obtain positive results in lactation with the hypophysis hormone, but it was later found that the previous presence of the corpus luteum was not necessary.

The main difference from normal lactation was that in pregnancy the mammary gland first proliferates without milk secretion, while in experimental proliferation milk secretion occurred simultaneously with the development of the gland.

Multiple ovaries and the oestrous cycle in the white rat, J. L. FRIEDMAN and L. B. NICE (*Amer. Jour. Physiol., 95 (1930), No. 1, pp. 40–42*).—After determining the duration of the oestrous cycle by daily vaginal smears for 5 weeks in 22 virgin female rats, ovaries from animals of like age but in different stages of the oestrous cycle were transplanted into them, one in the kidney, and one in the muscle. The duration of the oestrous period subsequent to the operation was also determined. It was found that the oestrous cycles averaged nearly twice as long before transplanting the ovaries as after the ovarian transplants were made. The average daily voluntary activity of the females was 15 per cent greater after they received the additional ovarian material, but there was no change in the rhythm of the activity.

On the presence of oestrin in the urine of the pregnant cow [trans. title], A. LIPSCHÜTZ and S. VESHNJAKOV (*Biochem. Ztschr., 220 (1930), No. 4–6, pp. 456–460*).—Urine samples from seven pregnant and nonpregnant cows were found to contain some oestrin, but the amount per liter was much less than in samples of urine from pregnant women. The use of this test for pregnancy in cows is questioned owing to the suggested variability of the oestrin content of the urine associated with the ration.

FIELD CROPS

Fifteen years field crop work, Prescott Dry-Farm, 1912–1927, S. P. CLARK (*Arizona Sta. Bul. 136 (1931), pp. 583–613, figs. 6*).—This summary is preceded by meteorological observations noted on page 806.

Varietal leaders over various periods included Hickory King corn for silage, Reid Yellow Dent for grain, and Papago Sweet and Pima of the native corns; Sumac sorgo and Red and Pink kafir for forage, and White and Dwarf Yellow milo for grain; and Lady Washington, Bates, and tepary beans. Alfalfa could not be grown successfully in the district without irrigation, and small grains were unprofitable largely because of winterkilling and lack of moisture in April, May, and June. Sorghums and corn put in with the planter usually returned larger yields of feed than when planted with the lister. Comparisons of cropping systems indicated that the most practical way of maintaining the soil fertility in the district was by the limited application of barnyard manure. In cultural tests with Red Amber sorgo for silage, plats cultivated with sweeps made the largest yields and plats cultivated with shovels came next.

[**Agronomic experiments in Guam**], J. GUERRERO (*Guam Sta. Rpt. 1929, pp. 6–10, figs. 2*).—Further studies (E. S. R., 63, p. 129) reported on embraced variety tests with cowpeas, legume cover crops, lawngrasses, sweetpotatoes, and trellised and nontrellised yams, and cultural, adaptation, and palatability tests with forage grasses.

Napier grass was found adapted to the tillable soils, thriving even on certain sandy beaches where few, if any, other crops except coconuts are produced. The adaptations of Guatemala grass, Japanese cane, *Pennisetum setosum*, and Merker grass also are indicated. On the lowlands centipede grass made the best growth of the lawngrasses, covering the ground satisfactorily, and was followed by carpet grass. The latter, however, was rather coarse and appeared to be less suitable than other grasses tried for lawn purposes. On soils similar to that of most of the northern half of the island, carpet grass nine months after planting made the best growth and Japanese lawngrass next best, while centipede grass made a very poor showing. On clay loam of fairly good texture, for many years devoted to Paspalum, carpet grass, centipede grass, and Japanese lawngrass made good growth. Nine months after planting centipede grass covered the ground more effectively than other grasses tested and was followed by carpet grass.

[**Field crops investigations in Illinois**] (*Illinois Sta. Rpt. 1930, pp. 44–51, 53–63, 64–68, figs. 8*).—The progress of agronomic experimentation is reviewed as heretofore (E. S. R., 62, p. 327).

That selection of corn, continued by C. M. Woodworth and W. J. Mumm, was still effective after 33 years was shown by the oil contents of 11.52 per cent in the high oil strain of corn and 1.36 per cent in the low oil strain. The high protein corn averaged 17.69 per cent of protein and the low protein 6.32 per cent. The ears in the high ear strain averaged 82.1 in. aboveground and the low ear 3.8 in. Defects observed were low yields in the protein and oil strains, probably due to inbreeding, small germ accompanied by poor germination and lodging in the low oil strain, and lodging in the high ear strain. A strain of Reid Yellow Dent reconstituted by selfing for 1 year and mixing the remnants of the best performing selfed ears continued to be promising. Another finding in this study made it possible to produce a true breeding, soft-starch strain of corn in any variety by suitable crosses with corn carrying the soft-starch factor.

Harvesting seed corn after the grain is well dented and the husks are brown, but while the stalk and upper leaves are still green proved sound practice in studies continued by G. H. Dungan, W. L. Burlison, and B. Koehler. The advantages of being able to consider stalk characters while the corn was still in the dent stage outweighed benefits of waiting until the seed was more mature. The average yield from seed harvested in the milk stage was 39.4 bu. per acre, glaze 42.2, dent 55.1, mature 54.9, and husking stage 54.8 bu.

That the corn borer will have to be highly destructive in Illinois before growers will be warranted in trying to control it by planting corn as late as the second week in June was established by Dungan. Results in 3 years showed a marked lowering of yield from planting June 7 to 11, and test weights were progressively lower as planting was delayed. Short-season varieties usually produced grain of better test weight than mid-season, and both types surpassed full-season varieties in test weight. F. C. Bauer observed that corn planted late because of corn borer or other causes can be hastened to maturity by good soil treatment. Varietal differences were quite noticeable.

No significant differences between the fertilizing values of cornstalk residues and ashes showed up in a comparison by D. C. Wimer, who applied the residue and ash treatments just before preparing land for soybeans which followed corn in a 4-year rotation. The yields of soybeans and clover hay were alike for both treatments, whereas residues were slightly superior to ashes both on wheat and corn.

The total amount of phosphorus absorbed and retained by the growing corn plant was found by E. E. DeTurk, F. M. Wilhite, and J. R. Holbert to be fairly constant for a given strain. Phytin, which constitutes most of the seed phosphorus, was found present in insignificant amounts in the vegetative parts or during the vegetative period of growth. The activation of the phytin-forming function appeared to result directly from the fertilization of the ovule. In young pollinated ears, phytin appeared in the kernels shortly after they began to form. The shank maintained a very high concentration of total phosphorus, but contained no phytin. A similar ear protected against pollination by bagging was equally high in total phosphorus content, but contained no phytin, even in the unfertilized ovules. Mature stalks, blades, and husks showed none. Examination of germinating corn kernels showed no phytin in a sample withdrawn at the end of 36 hours or in subsequent samples. Since phytin is hydrolyzed by phytase, it was evident that phytase is formed very rapidly at the beginning of the germination process.

Reduction of the leaf area of corn plants, in continued simulated hail damage studies by Dungan, lowered the yield or the quality of the grain, and frequently both. When the blades or portions of blades were removed early in the reproductive period, the most striking effect was a reduction in yield, sometimes to the extent of complete barrenness. The more advanced the reproductive structures were at blade removal the less harmful was the treatment to yield or quality of grain. The corn on the tip of the ear was most often made light and chaffy by reduction of blade area and many ears on treated plants were poorly filled on one side. The upper blades in the vegetative stage of growth and the middle blades in the reproductive stages were found to be most important in their influence on grain yield.

A study of the corn grades on 1,227,546 inbound carloads of corn inspected from December 1, 1916, to November 1, 1929, at the 13 official inspection service points in Illinois showed L. F. Rickey that millions of dollars have been

lost during recent years by Illinois corn growers in discounts levied against a declining grade of grain.

In a study of the utilization of crop residues, O. H. Sears observed that nitrate nitrogen content was decreased uniformly by the application of straw to many kinds of soil. With some heavy soils one group of organisms was concerned, while in sandy soils another kind of organism was responsible for the change.

During 4 years J. J. Pieper and W. P. Flint found that northern grown potatoes yielded about one-third more than home grown tubers stored at the same temperatures. The best storage temperature seemed to be 36° F. Spraying with Bordeaux mixture in addition to calcium arsenate increased yields more than 20 bu. per acre.

The chlorates of both sodium and calcium showed promise in weed control studies by Pieper. The higher rates, 3 to 5 lbs. a square rod, generally gave the best results, and late applications, beginning with the blooming of the plant and continued until frost, were the most promising. There was little difference in the effect of wet and dry applications and best results were obtained from plats not disturbed during the growing season in which the application was made. Chlorates gave best results with Canada thistles, but were not very effective on wild garlic and wild onions, and quack grass was not controlled satisfactorily. Study of the life history of wild garlic (E. S. R., 63, p. 37) indicated that infested land should be plowed in the spring before the underground bulblets are well formed and late in the fall after most of the bulblets have started germinating.

Variety tests in one or more localities in the State for the year and various periods carried on with corn, wheat, oats, and barley are reviewed by Dungan and Burlison, and the progress of breeding work with corn by Woodworth and Mumm and with wheat, oats, and barley by Woodworth and O. T. Bonnett, and winterkilling and natural crossing of wheat are also reported on.

[**Farm crops investigations in Iowa**] (*Iowa Sta. Rpt. 1929, pp. 12–14, 15, 16, 55–58, 64, 65*).—Ladak alfalfa showed extreme winter hardiness and outyielded Grimm. Although yielding less than domestic strains, Turkestan alfalfa was very winter hardy and surpassed other varieties in wilt resistance. Imported red clover continued to be inferior to domestic seed in winter hardiness and yield.

Hay curing studies indicated that, considering both quality and time required for curing, the best results could be had by allowing hay to become about one-third cured in the swath before putting in the windrow, using a left-hand side-delivery rake. Hay could safely be put in the mow when it contained about 25 per cent of moisture.

A pasture experiment at the station gave further proof of the beneficial effects of disking, reseeding, manuring, and fertilization, particularly with a phosphatic fertilizer. On Knox silt loam in Plymouth County, too rough and steep to be cultivated, producing native grasses such as bunch grass, buffalo grass, and bluestem, sweetclover was permanently established after the second year and was the only legume which would make satisfactory growth. Its growth was increased by superphosphate additions. Reseeding without disking resulted in only a few scattered plants. Disking and controlled grazing appeared necessary for a stand of sweetclover. On Shelby loam in Clarke County reseeding without disking was of no value. Manure benefited the growth of both the legumes and grasses, while limestone apparently was of most importance in securing a stand of alfalfa and sweetclover, although beneficial to red clover. Superphosphate increased the legume growth to a marked extent.

Controlled grazing the first year appeared necessary in establishing a good stand of legumes.

The scope of corn improvement work in cooperation with the U. S. Department of Agriculture is outlined. Genetic studies (E. S. R., 63, p. 218) showed the inheritance and linkage relations for two new factors producing yellow seedlings in corn. In continued linkage studies the iojap factor (E. S. R., 53, p. 29) was found to be located on chromosome VIII, and its linkage relations with ramosa, glossy, and frayed are being studied.

A survey of the 1928 State corn acreage showed that about 10 per cent of the 10,000,000 acres of corn in Iowa was planted with varieties located and given publicity by the State corn yield test. Of 11 high-yielding varieties compared with F_1 hybrids between selfed lines, Block Yellow Dent led with 69.7 bu., whereas the best cross made 95.4 bu., and 4 crosses made 90 bu. or more per acre. In a test where Krug Yellow Dent yielded 75.9 bu., 1 double and 1 single cross exceeded Krug by more than 27 bu., and 23 and 24 double crosses, tested for the first time, surpassed Krug in yield.

Good commercial corn was crossed with various inbred lines as sires to note the effect of a uniform (homozygous) inbred line on yield. The most noticeable feature of the progenies from crosses of Krug with some of the best inbred lines was the increased uniformity of the plants, particularly in that nearly every plant produced a marketable ear. In one district in the north-central section in the State yield test where the average of the farmers' varieties (open pollinated class) averaged 70 bu. per acre the highest Krug × Inbred (Lancaster) progeny yielded 79 bu., the second entry 77 bu., and the third entry, Krug × a very early inbred from a small-eared corn, 70 bu.

[**Agronomic investigations in Kansas, 1928–1930**] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 22, 23, 28–32, 33–47, 138–140, 143–147, 148, 149, 150*).—Field crop experiments (E. S. R., 61, p. 125) continued at the station and substations included variety tests with wheat, corn, pop corn, oats, barley, grain sorghum, sorgo, soybeans, alfalfa, sweetclover, lespedeza, and miscellaneous grasses and legumes; breeding work with corn, wheat, oats, barley, grain sorghum, and soybeans; cultural (including planting) tests with corn, wheat, grain sorghum, soybeans, and alfalfa; fertilizer tests with wheat (E. S. R., 63 p. 828), lawns, and native pasture grasses; studies of the draft on soil moisture by alfalfa (E. S. R., 61, p. 519), and fertilized crop rotations. Activities at the Tribune Substation have been noted (E. S. R., 63, p. 433).

Varieties of merit in cooperative tests with farmers throughout the State included Pride of Saline corn in eastern Kansas and Freed White and Hays Golden in western Kansas, Red kafir, Kanred and Turkey wheat, Kanota oats, Flynn and Club Mariout barley, Kansas Common and Grimm alfalfa, and A. K. and Manchu soybeans.

Wheat yields in long term rotations including alfalfa or bromegrass and manured, averaged considerably higher than yields in unmanured long term or in short term rotations or from continuous wheat. Wheat yields in tillage studies were in proportion to the earliness of summer plowing and degree of weed control. During 1929 yields of wheat were found to be related very definitely to leaf rust and Septoria. An instrument devised made it possible to determine easily and quickly the breaking strength of the straw. Studies over five crop seasons showed a definite negative correlation between the breaking strength of straw so determined and lodging.

The effects of subfreezing temperatures on varieties of winter wheat, winter rye, and alfalfa were given special attention. With rye and with winter wheat varieties an almost perfect relation was found between ability to survive low

temperatures and distribution, i. e., varieties from northern regions almost invariably survived better than those from middle latitudes or southern regions. Of alfalfa varieties a strain of Provence survived best, Grimm and Ladak were almost as good, and Kansas Common and Utah Common somewhat less hardy. In a very few tests where included, Arizona Common survived the least of any.

Corn investigations in cooperation with the U. S. Department of Agriculture continued to show that with full-season varieties of corn dates of planting somewhat earlier than usual give the highest yields, about April 20 to 30 appearing optimum at Manhattan. In studies anticipating control measures with the European corn borer it thus far appeared impossible to obtain as large yields from early corns variously planted at later dates as from full-season varieties planted at the normal time. Closer spacing than 16 in. apart, at which distance Pride of Saline corn was most productive, gave materially higher yields of stover with greatly reduced grain production. In an extensive test of hybrids of yellow segregates v. hybrids of white segregates of inbred lines from yellow × white crosses, where the pairs of segregates were practically identical except in endosperm color, the yellow hybrids outyielded the white by 1.21±1.21 bu. per acre. This seemed to indicate that under the experimental conditions there is no secondary effect of the factors for yellow endosperm which necessarily depresses yield.

In pasture studies (E. S. R., 60, p. 358), the capacity of bluestem pastures grazed by the deferred and rotation system for 11 years averaged 30 per cent higher than those grazed season long. The respective amount of feed expressed as animal days per acre was 50.5 and 32.9, i. e., a 53 per cent increase for the rotation system. The gain in weight of stock grazed in the rotation pastures was 20 per cent greater and the quality and quantity of the forage slightly better. The study revealed the rapid invasion of bluegrass in the pastures grazed under both systems, a condition probably existing through the entire bluestem pasture region.

Experiments with burned pastures on native pasture land showed the unburned plats to yield the most vegetation, fall burned the least vegetation, and late spring burned the least weeds. The results indicated that in an average year the growth of vegetation will be slightly earlier on burned plats, while in a cold, backward spring it will be more advanced on unburned areas. Burning appeared to have little effect on weed and brush control unless done as late as May 1 or after. Late burning tended to reduce the density of the stand of vegetation, increase the height of top growth, and to encourage the growth of the coarser grasses. There was little successional difference in the vegetation on plats burned in early and medium spring. Conclusions were that since burning reduces the yield of vegetation it should be practiced only in years when the large amount of old grass on pastures would effect the even distribution of the livestock.

The effects of various frequencies of cutting bluestem pasture have been noted (E. S. R., 63, p. 729). Continued efforts to eliminate undesirable plants from pasture land showed that eradication was most complete when the weed plants were cut when they had the least amount of stored food, i. e., usually when in the bud or early flowering stage of growth. Cutting a month earlier or later than this time affected the plants very little. Mowing appeared to be the most feasible control method. Burning may be used effectively under special conditions, and where small, dense areas of noxious weeds or shrubs occur spraying with sodium chlorate may be a practical eradication measure.

Pasture grasses collected from undisturbed areas at intervals throughout the growing season showed a gradual diminution in feeding value as the season

advanced. Samples collected about May 15 had about 14 per cent protein, August 1 less than 4, and September 12 less than 3 per cent. The carbohydrate content increased somewhat as the grasses approached maturity. Grasses showed a marked increase in protein content when nitrogenous fertilizers were applied. Wheat and rye leaves collected in the fall and spring were remarkably high in protein, mineral, and carbohydrate content. Study of stored reserve foods in roots of grass plants from protected areas, collected at intervals throughout growth, showed a decrease in stored carbohydrates until about June 15, and thereafter a gradual increase until the end of the growing season, the increase in little bluestem grass being about 300 per cent. No increase in the protein storage was noted until the end of the growing season. The quantity of stored reserves was inversely proportional to the frequency of cutting.

Turf and lawngrass studies showed the Washington and Metropolitan strains of bentgrass most desirable. However, bentgrass did not seem practical for lawns in the section because of the need of clipping closer than possible with ordinary lawn mowers and its susceptibility to brown patch disease. Fertilizer tests showed that a good turf of bentgrass could not be maintained without fertilizers, the best turf being produced by the use of both fertilizers and compost. Ammonium sulfate, sodium nitrate, and urea gave satisfactory results and differed little in their effects. Their use was followed by increases in yield of clippings of 300 per cent for bluegrass and over 500 per cent for Washington bent. Weed control seemed to be largely a matter of maintaining a vigorous growth and dense turf of grass. Clover predominated in unfertilized bentgrass, while very little appeared in plats treated regularly with fertilizer and compost. Ammonium sulfate and iron sulfate were promising in controlling dandelions in bluegrass.

For killing bindweed, calcium chlorate and magnesium chlorate when used in equal quantities with respect to the chlorate ion were as effective in 1928 as sodium chlorate. A commercial mixture of calcium chloride and sodium chlorate was not so effective pound for pound as sodium chlorate because this material contained only about 57 per cent of chlorate equivalent. Thorough distribution of the chemical is considered essential. The use of other chemicals mixed with sodium chlorate appeared of doubtful value except in so far as they may be used to reduce the fire hazard. As good results were obtained when the initial treatment was delayed as long as one or two months later than the time previously (E. S. R., 59, p. 137) recommended. Delayed treatment results in a saving of material and labor, since three applications begun in August were as effective as four applications begun earlier. Good crops of sorghums, Sudan grass, and sweet corn were grown on plats treated the previous season. Sudan grass seemed to be more nearly normal in growth than any other crop tried. Cultivation with a row crop, probably the most perfect method of handling land the season following treatment for bindweed, may be supplemented by treatment with sodium chlorate of the remaining bindweed plants after removal of the crop.

Seed bed preparation studies at Garden City on dry land in cooperation with the U. S. Department of Agriculture on continuously cropped land definitely favored early cultivation before planting for weed control and conservation of moisture. Kafir lister planted on land previously cultivated to control weed growth averaged 5.1 bu. more per acre than that lister planted on land not cultivated in early spring. The best methods of fallow for wheat consisted of fall listing or fall plowing followed by clean cultivation the next

summer. Wheat on the best prepared fallow averaged 12.5 bu. per acre and on the poorest method of fallow late spring-plowed 9 bu. per acre, practically no better than the best method of continuous cropping.

In experiments at Garden City with crops under irrigation alfalfa appeared to require from 36 to 40 in. of water annually besides the rainfall for best results. Yield increases from larger amounts did not appear to be sufficient to justify the additional cost. Water applied early in spring seemed to stimulate early growth and to be more effective than an equal amount applied the previous fall. The highest annual yield of alfalfa hay was produced on land irrigated in late fall and again in early spring. Commercial fertilizer and barnyard manure did not increase appreciably the yields of alfalfa, milo, and winter wheat, whereas sugar beets showed a material yield increase when barnyard manure was applied at the rate of 10 tons per acre every second year to land continuously cropped to beets. Sugar beets in 5 years averaged 20.8 tons in rotation with alfalfa and sorghum, 19 on manured land continuously cropped to beets, and 16 tons on land continuously cropped and unfertilized. Cultivated grasses in irrigated pastures also showed increase in growth when manured. Both grain and forage sorghums produced higher yields in rotation with alfalfa than when continuously cropped. A single heavy application of water about doubled the yields of the better varieties of corn and sorghums grown without irrigation. Fall irrigation produced yields still greater than early spring or winter irrigation. In general the same varieties most satisfactory on unirrigated land were the highest yielding under irrigation.

Yields from different methods of seed preparation on dry land at Colby averaged for 15 years for barley on summer fallow 35.8 bu., continuous on spring plowing 19.5, and on fall plowing 21; after oats on spring plowing 19.9 bu.; and on disked corn land 17.8 bu. Continuous corn made its highest average yields, 20.9 bu., on land disked early and listed and 19.9 bu. listed without previous cultivation, and corn after small grain 17.8 bu. on spring plowing.

[Legume research in Illinois] (*Illinois Sta. Rpt. 1930, pp. 36–44, figs. 2*).—Investigations with legumes are again reported on (E. S. R., 62, p. 328).

That hay crop failure and poor yields can be avoided by proper combinations of forage plants was established by J. J. Pieper. Grass hays can be improved by using mixtures including clovers; alfalfa stands last longer when timothy is used in the mixture. Alfalfa and timothy during 5 years yielded more than any combination which included alfalfa, but not until the third year did the mixture begin to yield better than alfalfa alone. Loss of the alfalfa stand when grown with timothy was about one-half that of alfalfa alone. The alfalfa wilt disease was about twice as bad in alfalfa as in the alfalfa-timothy mixture. Red clover and winter vetch did not increase the yield of hay when used with alfalfa. Winter vetch and oats as an emergency hay crop over 5 years slightly outyielded field peas and oats, and Sudan grass and soybeans proved to be the best late emergency forage. Red clover in combination with any of the grasses increased the hay yield and with alsike clover and timothy made the highest yielding mixture.

Sweetclover in studies by O. H. Sears benefited succeeding crops when plowed under in the fall or early or late spring and aided the succeeding crop decidedly even after a fall hay crop had been removed. Previous conclusions that the benefits of sweetclover are partly due to its effect upon the activity of soil microorganisms were confirmed. Sweetclover evidently may be plowed in the fall of the first year or early in the spring of the second

year with satisfactory results in crop yields. On some soils and under some climatic conditions fall plowing may make it harder to kill the sweetclover in the corn.

Soybean varieties, C. M. Woodworth established, differ in important yield factors, such as percentage of abortive seed (E. S. R., 63, p. 230). Pure line selections also showed considerable variation with respect to this point, but no improvement was made by selection within the variety. Measurements and counts on Illini and Manchu soybeans showed the characters of greatest importance in yield of seed to be number of nodes, number of seeds per pod, percentage of abortive seed, and size of seed. Crossing lines differing 2 per cent in oil content did not isolate any lines exceeding the parents in oil content. Extreme variations exhibited in 1928 by F_2 plants were not transmitted to the F_3 grown in 1929. However, in crosses between two low lines, each averaging about 17 per cent oil, certain F_2 plants had seed analyzing as low as 14.6 per cent. New selections led the soybean variety tests of J. C. Hackleman and W. L. Burlison. Seeding trials indicated as best May 10 and 20, and the best yields came from 55 to 60 lbs. per acre in 24-in. rows, which considerably outyielded plats drilled solid.

No single group of nodule bacteria is prevalent in all Illinois soils, according to studies by Sears, W. D. Gifford, and H. E. Myers. Ability of an organism to produce nodules on a legume, particularly under greenhouse conditions, was not a measure of its effectiveness in the field. Of 83 soils collected at random in Illinois, 72 per cent contained nodule bacteria of red clover, and nodule bacteria of sweetclover were found in 26 per cent and soybeans in 10 per cent of the soils. As the acidity of the soils increased, a smaller percentage contained red clover and sweetclover nodule bacteria.

Although cowpea and soybean nodule bacteria are somewhat interchangeable as to nodule formation in the greenhouse, they differed in nitrogen fixing ability. Soybean bacteria were less efficient on the cowpea plant than on the soybean, and vice versa. Since no one group of nodule bacteria was found in all soils, artificial inoculation may be worth while with all legumes, being especially important where sweetclover, peas, and soybeans are to be grown and with red clover to be seeded on sour soil or on sour soil which has been limed. Variations were found by Sears and M. F. Hershberger among the cultures of individual distributors of legume inoculants, as well as among the cultures put out by different companies. One-half pint of liquid culture was found to be plenty for inoculating a bushel of legume seeds such as soybeans, whereas some distributors of wet cultures recommended the use of more water than is advantageous.

The greatest benefit from the inoculation of soybeans, Sears found, came in the form of heavier yields of beans, although there was some benefit to succeeding crops. Besides the nitrogen added to the soil by the nodule bacteria, the growing of soybeans made the soil nitrogen more available to succeeding crops. Recent results indicated that the soybean itself profits more from the inoculation than does the succeeding crop, and in some cases a crop following inoculated soybeans is no better than one after uninoculated beans.

Red clover seed and hay yields, according to results of Pieper, W. P. Flint, and J. H. Bigger, can be increased by clipping about September 1 of the first year. Clipping in the spring of the second year is not recommended for seed production. The first crop of clover during the second year yields the most seed, while the hay crop followed by a seed crop seems to be the most desirable. Where the hay is not needed the first crop of clover may well be cut for seed. On soil slightly acid or too wet for best results with red clover, alsike clover

may be substituted. Little difference in the stand of red clover sown in winter wheat has been noted on adjoining broadcast and drilled plats. Red clover sown on March 22 made a better stand than that planted one month later.

The place of annual legumes in the cropping system of the semi-arid high plains, D. R. CAWLFIELD (*[Oklahoma] Panhandle Sta., Panhandle Bul. 25 (1931), pp. 13*).—The place of annual legumes (E. S. R., 63, p. 437) in the cropping system of the high plains will probably be a subordinate one for some time, since the region is devoted primarily to grain production, although they can be used profitably to provide part of the feed for livestock, especially dairy cattle. Varieties outstanding in hay production included tepary beans, Dwarf mung beans, Laredo soybeans and Blue Goose, Whippoorwill, and Early Red cowpeas. Tepary beans appear to be best adapted for forage production in the region. The somewhat lower average yields of some of the legumes compared with kafir and sorgos may be offset considerably by their high protein content and the benefit of the legume to the soil. It may be possible to make higher yields when the optimum spacings are determined.

A comparison of methods of preparation for summer hay crops, H. H. FINNELL (*[Oklahoma] Panhandle Sta., Panhandle Bul. 24 (1931), pp. 11*).—Methods of preparing land for Sudan grass grown for summer hay were compared from 1923 to 1930 on heavy silt loam under an annual rainfall averaging 17.59 in. Sudan grass manured continuously in continuous culture returned markedly lower yields than in rotation with or without manure. Fall plowing was the only tillage method to give a substantial yield increase over no preparation in the fall, and distinctly higher yields came from plowing and subtilling every other year than annually. Fall plowing in years when plenty of moisture was present in the topsoil produced substantially higher gains in yield over no preparation than in years when dry plowing conditions prevailed.

What may be expected from hybrid corn? G. H. STRINGFIELD (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 63–66*).—Hybridization experiments with corn at the Ohio and other stations and in cooperation with the U. S. Department of Agriculture are reviewed, with the conclusion that hybrids between varieties offer little promise in corn improvement. Hybrids between selfed lines, however, seem quite promising, both as to higher yields and as to producing corn better able to withstand specific adverse influences, such as the European corn borer and disease. The usual open-pollinated varieties evidently should be depended upon until experience from small plantings indicates the advantage of hybrids.

Field experiments with cotton, R. S. HAWKINS (*Arizona Sta. Bul. 135 (1930), pp. 553–581, figs. 7*).—Cultural, irrigation, and variety tests with cotton were carried on at the station, the Salt River and Yuma Valley Experiment Farms, and cooperatively in Greenlee and Maricopa Counties.

Where the lower 200 ft. of borders 600 ft. long were leveled, yields thereon were 15 to 25 per cent greater than on the upper parts having a fall of about 2 in. per 100 ft. The difference was greater with closely spaced cotton. Subsoiling before planting did not seem to affect yields. The daily mean air temperatures were found fairly close to those of the soil at cottonseed bed depths at planting. Evidently cotton should not be planted until the mean temperatures approximate 60° F. or higher. The best stands and yields were obtained when cotton was planted by some method designated to insure close contact between the seed and moist soil. Yield differences between plants 6, 12, 18, and 30 in. apart in the row were inconsistent and not significant. Cotton hoed for weed control but not cultivated yielded as well as that

receiving ordinary cultivation. Cultivation seemed of value in improving soil conditions.

Experiments on frequency of irrigation showed water applied at 2-week intervals during blooming to return highest yields on the clay loam at the Salt River Valley farm, at 10-day intervals on the rather sandy soil at Tucson, and at 4-week intervals on the heavy soil at Yuma, where the irrigation water often carries a heavy load of silt.

The yields in the earlier years of rotations, terminated because of pink bollworm, are cited. The increasing differences in cotton yields following hegari (sorghum) compared with that after corn were small but indicative of a possible cumulative detrimental effect where sorghum has been grown in alternation over a period. It is pointed out that the deleterious effect of sorghum nearly disappears during the several months of fallow between sorghum harvest and cotton planting.

The Acala variety had a slight lead over other upland cotton in lint production at the Salt River Valley farm, while Mebane led at Yuma. Pima cotton had the largest gross value of lint per acre by a wide margin at both places after adjustments were made for its extra picking and ginning costs.

Results of cotton variety experiments for 1927–30 and production and consumption of different staple lengths, P. H. KIME and S. J. KIRBY (*North Carolina Sta. Agron. Inform. Circ. 57 (1931), pp. [1]+6*).—Similar in scope and recommendations to an earlier report (E. S. R., 62, p. 629), this circular indicates certain strains of Mexican and Cleveland cotton for light to medium-heavy soils in the Coastal Plain and Piedmont, early, light foliaged sorts (as the Fosters) for heavy and poorly drained soils in the lower Coastal Plain, and Dixie and Dixie Triumph for wilt-infested soils. The quantity of cotton stapling (1 to 1$\frac{1}{16}$ in.) consumed by mills located in the Southeastern States far exceeds the production in this region, while the domestic demand for short cotton (⅞ in. and under) is very limited.

Source and care of cotton-planting seed on some North Carolina farms in relation to length of staple produced, J. H. MOORE and J. A. SHANKLIN (*North Carolina Sta. Agron. Inform. Circ. 58 (1931), pp. [1]+10*).—The source and care of cotton-planting seed in relation to length of staple produced was studied in the fall of 1930 on 232 farms in gin areas in Lenoir, Northampton, Union, and Mecklenburg Counties.

Many growers obtained seed from neighbors without investigating purity and other desirable qualities, and many changed varieties each year, while a few held to a standard cotton for several years. In areas where one variety predominated, seed stocks were kept up to a fair standard without special care to prevent seed mixing at the gin. The length and uniformity of staple was associated directly with the selection and care of seed stocks. The staple produced by pure seed of improved cottons was superior to that from mixed seed of the same varieties or from the short staple, mixed, or run down varieties. In general pure seed of improved varieties produced the highest yields. Cotton producing short and untenderable staple generally yielded less than varieties with a staple of $\frac{15}{16}$ to 1$\frac{1}{16}$ in.

Suggested plan for improving the quality of cotton in North Carolina, R. Y. WINTERS (*North Carolina Sta. Agron. Inform. Circ. 59 (1931), pp. [1]+4, fig. 1*).—The plan in outline provides for division of the State into three regions according to soil and climate, for one-variety regions based upon market demands and adaptation of cotton varieties, and for adequate seed supply to maintain the quality and uniformity of staple length.

Crotalaria, a new legume for the South, R. McKee and C. R. Enlow (*U. S. Dept. Agr. Circ. 137 (1931), pp. 31, figs. 6*).—The habitat, characteristics, and climatic and soil needs of Crotalaria are described, its value as a forage, green manure, and smother crop and its cultural requirements are indicated, and notes are given on plant diseases (by G. F. Weber) and on insect pests. The 36 species studied are described, with agronomic notes and a determinative key. Experiments with crotalaria in the South were in cooperation with the Florida and Georgia Coastal Plain Experiment Stations and the Sandhills (S. C.) and Coastal Plains (Miss.) Substations.

The two species used commercially in the United States, *C. striata* and *C. spectabilis*, are upright, short-lived plants which must be treated as summer annuals under our conditions. The principal use of crotalaria is for green manure; certain species evidently can be used for hay, while others probably are poisonous. The forage and green manure yields of crotalaria on poor sandy lands in the South have been heavy, indicating that this crop has a place under such conditions. The seed ripens over a prolonged period, making seed harvest rather difficult. The organism that inoculates crotalaria is widely distributed, and artificial inoculation has not been found necessary. Crotalaria is immune to nematodes and has been free from any serious fungus disease, whereas the pumpkin bug and the bella moth have been somewhat serious at times on the seed crop.

Potato growing in the irrigated districts of Washington, H. J. Jensen and O. M. Morris (*Washington College Sta. Bul. 246 (1931), pp. 30, fig. 1*).—Production practices for potatoes in the irrigated districts of the State are suggested from experiments at the Irrigation Substation from 1925 to 1929 and from experience.

Optimum conditions for good yields of quality tubers include mellow sandy loam soil, a suitable rotation or following a good green manure as hairy vetch or sweetclover, sets about 1 to 1¼ oz. dried for a few days before planting or else dusted with flowers of sulfur, rather late planting and spacing on fertile soil with abundant water of 6 to 12 in. apart in 33-in. rows, and irrigation such as to maintain a uniform soil moisture content throughout the growing season. Unless the water supply is abundant throughout the season only moderate amounts are to be used in the early part of the season so as to limit the size of the plants.

Exposure of freshly dug tubers to the hot sun caused serious injury, whereas potatoes could lie on the ground for 3 or 4 hours at 75° F. without harm. Harvesting during hot weather evidently should be done so as to prevent exposing the potatoes to the direct rays of the sun for longer than a few minutes in digging.

Varietal leaders included Irish Cobbler, Bliss Triumph, and Netted Gem. Using locally grown seed for more than two consecutive crops reduced the yield seriously. The difference in yield between local seed grown under irrigation and seed of other districts was probably due largely to the rapid spread of virus diseases in the irrigated field. Diseases most frequent in the plats and commercial fields near Prosser were mild mosaic, rugose mosaic, curly dwarf, and spindle tuber.

In tuber development studies on Netted Gem, stolons were well started before the sprouts appeared aboveground. Tubers ⅛ to ¼ in. in diameter were formed before the plants were 4 in. high, although tuber enlargement did not keep pace with the growth of the plant. Blooming occurred between July 23 and August 6, and the plants made little growth in height, new leaves, or new

side branches thereafter. Tubers finally reaching marketable size were well started by August 6, and the number of market size tubers did not increase afterwards. Rapid tuber growth lasted for about 6 weeks after blooming, slowed down for about 2 weeks, and then recurred for a week ended with September 24.

The Tokio soybean, C. A. MOOERS (*Tennessee Sta. Circ. 35 (1931), pp. 4*).—The Tokio soybean, tested in cooperation with the U. S. Department of Agriculture, is described as a late (setting fruit in late August or early September), heavy yielding, nonlodging, fine-stemmed variety with light green seeds resembling those of Mammoth Yellow in size. It surpassed important competing soybeans in yield of hay and seed and was superior in nearly every other quality.

Planting experiments indicated early April, 5 lbs. of seed per acre for seed production, and 20 to 30 lbs. for fine-stemmed hay, for broadcasting 1.5 bu.; cleanly cultivated 2.5 ft. rows, especially for seed production, and depths of 1 in. or less. Trials in various parts of the State showed soybeans highly responsive to liming, phosphorus, and potassium.

Sugar-beet growing under irrigation in the Utah-Idaho area, S. B. NUCKOLS (*U. S. Dept. Agr., Farmers' Bul. 1645 (1931), pp. II+34, figs. 14*).—This publication supersedes Farmers' Bulletin 567 (E. S. R., 30, p. 529), which it resembles in scope.

[Tobacco investigations at the Connecticut Tobacco Substation] (*Connecticut State Sta. Bul. 322 (1931), pp. 136–141, figs. 2*).—Considering the rôle of the mineral bases in combustion of cigar leaf, too much potassium in proportion to magnesium was observed to cause fusion of the potassium salts and inclusion of carbon particles that could not be oxidized, thus producing a dark colored ash. With such incomplete combustion, the resultant gases had an objectionable aroma and unpleasant flavor. When the proportion of magnesia was increased to about 2 per cent of the dry weight of tobacco, the ash was white or very light gray, indicating that combustion was complete; the coal band was narrow, and the taste and aroma were improved. It is held that too much magnesium must be avoided, since it caused the ash to flake. Calcium was much less efficient than magnesium in producing such beneficial effects.

Tobacco on plats receiving sodium nitrate or ammonium sulfate grew poorly, whereas all other nitrogen carriers resulted in good growth. Ground tobacco stems as the only source of potash resulted in growth as good as other potash carriers alone or in combination. Plats treated annually for five years with stable manure and artificial manure supplementing commercial fertilizer produced inferior tobacco, and black root rot was much worse than on unmanured plats. Cow manure replacing varying portions of commercial fertilizer on a shade plantation did not prove as good as commercial fertilizer.

Irrigated plats were much superior to tobacco receiving no water. Tobacco growing with the tractor (E. S. R., 62, p. 834) in place of horses was successful in its second year. Additional tractor machinery used in 1930 were a two-row setter, attachments for hilling, and racks for drawing tobacco to the shed.

Seed beds (plant beds) where the soil had been saturated with a 1 per cent solution of acetic acid were free from disease, as were adjacent beds sterilized with steam, although the latter contained fewer weeds.

Results with the curing chambers where shade tobacco was cured under controlled temperature and humidity indicated that these factors influence to a marked degree such characteristics as color, texture, grain, and prominence of veins. Relative humidities of 80 to 85 per cent were optimum for most conditions. With this humidity range, the optimum temperature for the

early pickings was found to be about 95° F. and for later pickings 85 to 90°. A temperature of 95° on the fourth picking produced a deep olive-brown, the so-called blue-black tobacco.

[Factors influencing the quality of Kansas wheat] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 32, 33, 53–58*).—Wheat grown after alfalfa was notably higher in protein content, but this effect was found to decrease with each succeeding year after the alfalfa was plowed up. It appeared that the longer a field is in alfalfa the higher will be the protein content of the wheat from that field. Other tests also showed that a legume preceding wheat increases the protein content.

Milling, baking, and chemical tests on a number of common Kansas varieties grown in different parts of the State since 1920 showed Kanred to be a wheat of superior milling qualities, Blackhull a good wheat but not quite up to Kanred or Turkey, and Superhard Blackhull, Early Blackhull, and Red Hull quite similar to Blackhull. Fulcaster had an unusually strong quality of gluten for a soft wheat, not far in baking characteristics from hard wheat grown in the same territory. Kawvale, a new soft wheat, in quality was of the same order as Fulcaster. Tenmarq, a new wheat variety of outstanding quality, will make good bread under a wider range of conditions than any other wheat in the tests. No matter where grown, it appeared to produce protein of unusually high quality. Michigan Wonder and Harvest Queen, typical soft wheats, evidently should be used more for making pastry flour. During three years Tenmarq excelled Blackhull and Kanred in weight of grain per plant and in protein content, a fact believed of special significance since the two factors are usually correlated negatively.

A questionnaire to mill superintendents having shown that the period of tempering ranged from 3 to 72 hours at their mills led to experiments productive only of the fact that a long tempering period is not necessary, at least for the kinds of wheat tried, especially if temperatures higher than room temperature are used. By using the right temperature as good results evidently may be secured with a short as with a long temper; a shorter tempering period would facilitate the milling process greatly.

In flour chemistry investigations it was found that the baking quality of flour could be increased very materially by subjecting the flour to a preliminary hydration process which increased the viscosity and other desirable properties of the dough. In research on fermentation of dough the baking quality of the flour could be determined by analyzing the flour for H-ion concentration, viscosity, soluble nitrogen, and salt effect at different acidities of the dough. Results by this method are said to check exactly with those of the baking tests. Chemical factors influencing the quality of wheat and flour also are discussed briefly.

HORTICULTURE

[Plant breeding at the Connecticut Station] (*Connecticut State Sta. Bul. 322 (1931), pp. 130–133, fig. 1*).—Notes are presented on various new station vegetable seedlings which show commercial promise. Evidence was secured that strawberries respond to inbreeding and crossing much in the same way as does corn. Black raspberries grown from seed were found free from mosaic and also uniform in plant and fruit characteristics, thereby suggesting the possibility of commercial propagation in this manner.

[Horticulture at the Guam Station], J. GUERRERO (*Guam Sta. Rpt. 1929, pp. 10–15, figs. 5*).—As usual (E. S. R., 63, p. 136), tests were made of various plants, of methods of propagation, etc. Some success was attained with the sapodilla introduced in the form of marcottaged cuttings. Scaly bark and

gummosis of the citrus was best controlled by scraping the infected parts and disinfecting the wounds with bichloride of mercury followed by an application of Bordeaux mixture paste. Of several remedies tested, Black Leaf 40 gave the best control of the tineid leaf miner. Side grafting with delayed removal of the top of the stock gave the best results in propagating avocado and mango.

Various tropical species, including teak, mahogany, and narra were found well adapted to Guam. Teak grown on river bottom soil averaged 14 ft. at 23 months after planting.

Coconut meal applied at the rate of 1,000 lbs. per acre gave increased yields in six tests with Kentucky Wonder beans. Notes are included on variety tests with beans, cabbage, and tomatoes, and upon the distribution of plant material.

Horticultural investigations (*Illinois Sta. Rpt. 1930, pp. 222–230, 231, 232, 236–239, 241–261, 262, figs. 4*).—Fruit breeding conducted by J. C. Blair and J. S. Whitmire resulted in the development of many promising apple and peach seedlings and of knowledge concerning the value of various parental combinations.

As reported by R. L. McMunn the Gold sweet cherry was found the hardiest in fruit bud in this type. Dr. Mathews is considered a promising home orchard apple.

Preliminary respiration tests by V. W. Kelley on apple twigs in the late dormant season of 1929–30 indicated varietal differences in respiratory activity in that season. As determined by W. A. Ruth and Kelley in pruning experiments with young fruit trees, heading back at planting time is not advisable, but trees should be disbudded leaving three or four well placed buds. With disbudding the resulting branch angles were more satisfactory and subsequent pruning was less.

Fertilizer experiments conducted by M. J. Dorsey and R. S. Marsh on mature apple trees indicated that the standard recommendations for the application of fertilizers do not need to be modified by the appearance of the newer materials. Hold-over effects of nitrate of soda were noted on Ben Davis trees until the midsummer of the subsequent year. As determined by Ruth most of the finer roots of apple trees growing in a shallow soil underlain with tight clay were grouped near the trunk and near the surface, making wide distribution of fertilizer unnecessary. Nitrate fertilization in the off year increased yields, fertilized Jonathans, for example, yielding an average of 56 lbs. per tree as compared with 22 for checks. Data presented by Ruth and Kelley upon a pruning experiment with bearing Grimes and Jonathan trees showed that pruning reduced yields decidedly in the Jonathan, but in both varieties decreased the percentage of blemished fruits. From work with young apples Kelley reports that pruning from the very beginning reduced growth and yield in proportion to the severity of the treatment. In 1929 unpruned Wealthy trees yielded 40.5 lbs., light thinned trees 25.9 lbs., moderately thinned trees 19.2 lbs., and severely thinned trees 10.3 lbs. Pruning delayed the initiation of bearing, reduced the size of the tree, and thinned the crop. Certain concentrations of oil sprays were found by Kelley to retard the opening of apple buds, the inhibiting effects being evident on Grimes for 6 weeks after treatment.

Comparisons by Dorsey and Ruth of cultivation and sweetclover cover crops in peach orchards failed to show any marked results, though the sweetclover interfered somewhat with other orchard operations. No indication was observed by Dorsey and McMunn of the desirability of splitting fertilizer

applications for young peach trees. No pronounced effect of potash was observed even with applications as large as 3 lbs. per tree. In two peach orchards no difference was seen in the value of nitrate of soda and ammonium sulfate. Fruit buds borne on the basal portion of the twig were slightly hardier than the others.

Continuing work in peach thinning, Dorsey and McMunn found that Elberta peaches could be thinned as late as the middle of July with beneficial results. McMunn found that pruning sour cherries improved the color of the fruit, resulted in more uniform ripening, and aided in increasing the effectiveness of orchard operations. Montmorency Ordinaire and Montmorency Large were the most productive varieties. Fertilization did not increase yields on the soil utilized.

Small fruit studies by A. S. Colby include tests of new varieties and species. Grapes, especially red varieties containing considerable Vinifera blood, stored satisfactorily at 38° F. Among the longest keepers were Agawam, Brighton, Catawba, Delaware, Niagara, Urbana, and Vergennes. The Kniffin system of training proved most satisfactory. The best canes were those originating near the trunk. In Moore Early the most productive canes were those 5–6 ft. long with a diameter of an ordinary pencil. With Concord the best canes were nearly 10 ft. long and of somewhat larger diameter. The most productive region on the cane was from the fifth to the twelfth node, making spur pruning inadvisable. Moderate pruning proved best. From 40 to 80 buds per vine proved desirable, depending on the vigor of growth. Under conditions of high soil fertility six arms gave an increased yield. Some promising gooseberry seedlings were procured from crosses and self-pollinations. Raspberry breeding progressed satisfactorily. Quillen seedlings contained a high percentage of resistant individuals. Certain Black Pearl seedlings produced yellow canes and salmon colored berries.

Vegetable studies conducted by J. W. Lloyd and E. P. Lewis in Cook County showed that different crops have specific fertilizer requirements, potash and nitrogen, for example, being especially beneficial to onion sets and nitrogen and phosphoric acid for cabbage. The results of tests with 10 crops and 16 different fertilizer treatments are presented, and show among other things the value of supplementing manure with commercial fertilizer, especially phosphorus materials. Manure alone was not found a balanced fertilizer for vegetable crops. Nitrates alone were not profitable. Manure was satisfactorily replaced by a combined program of high-grade commercial fertilizer and green manure crops.

Asparagus cutting tests by Lloyd and Lewis indicated that light cutting the first and second years after setting is not injurious. On the other hand, severe cutting was in these years distinctly harmful. Progress was made in the breeding of desirable strains of tomatoes, red cabbage, and beets for the Chicago market, and extensive trials upon various vegetable varieties are noted.

Inbreeding studies with sweet corn conducted by W. A. Huelsen and M. C. Gillis[*] resulted in the isolation of strains which upon recombination yielded desirable market types of high uniformity and yield. Tough pericarp and its reciprocal were apparently governed by hereditary factors. As determined by Huelsen, Gillis, and W. H. Michaels, a light application of a phosphorus-potash fertilizer increased sweet corn yields. Applying the material in the hill was more profitable than broadcasting.

Rate of planting tests conducted by Gillis with beans showed the highest yields in the case of 18-in. rows and close planting in the row. An account is given of the breeding of two Fusarium wilt-resistant tomatoes designated as

Blair Forcing and Lloyd Forcing. Studies by Lloyd and H. M. Newell upon the transportation of fruit showed the importance of adequate circulation of air through the cars.

Gladiolus forcing studies conducted by F. F. Weinard and S. W. Decker showed that varieties differ in their adaptability to forcing. Increasing the length of day with artificial light stimulated flowering but not economically. Gladiolus corms required a period of rest before forcing. Flanders, Seafoam, and Virginal were promising new varieties for forcing. Carnations grown in new soil outyielded those on two-year soil or on still older soils. Records taken on the production of blooms of summer-budded and winter-grafted roses showed no significant differences in yield or stem length, a situation reflecting in favor of summer budding because of its lesser cost. A total of 400 peony varieties were grown by H. B. Dorner and Weinard for taxonomic study. Weinard and Decker found that spring applications of superphosphate and sodium nitrate were beneficial to the peony. Heavy cutting of peony flowers apparently reduced yields of subsequent years.

[Horticulture at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 32, 33, 37–39, 41, 47, 48*).—Of several materials used in the control of apple scab, the standard lime-sulfur spray gave the best control. Lead arsenate was more effective than was calcium arsenate in the control of insects.

A seedling apple, Patten Greening × Delicious, proved attractive in color, size, and quality. To offset proposed embargoes on European seedlings progenies of several American varieties were tested as possible sources of future stocks. A Brier Sweet × Mercer County crab was found promising in quantity of seed produced and in character of growth. Comments are made on station apples that have been named and disseminated and on the Beirschmitt pear.

A comparison made between six inbred lines and three commercial varieties of *Cucurbita pepo* on the basis of the number of staminate and pistillate blooms per plant, average number of fruits per plant, and the weight of fruits showed favorably for the inbred lines, which led in greater average weight and number of fruits and did not show any definite loss of vigor.

Milkweed in its second year of seed production produced 30 bu. of seed and 280 lbs. of floss per acre. The seed fiber was found to have a very low moisture absorption coefficient and possessed, like kapok, the property of supporting many times its own weight when suspended in water. The woody stem tissue contained a higher percentage of lignin and cellulose than did cornstalks, approaching somewhat the hardwoods. A fiber board of merit was produced from milkweed.

Apple wood 1 year old contained 26 per cent cellulose, 12 per cent lignin, 10 per cent hemicellulose, and 5 per cent pectin. The pentose sugars, xylose and arabinose, were the only carbohydrates found present in the hemicellulose fraction and probably serve as reserve foods.

Studies of the acidity changes in apples and their relation to storage quality showed the greatest changes in active and total acidity during the prestorage period. There was noted a rather definite correlation between total acid content and keeping quality in storage, the amount of breakdown being generally inversely proportional to the rate and quantity of total acid lost during the same period. A high percentage of acid loss during cold storage was usually accompanied by a relatively smaller amount of unsound tissue formation.

[Horticulture at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 58–64*).—The addition of oils to lead arsenate sprays used in the control of codling moth had no apparent effect in increasing control, which was 97 per cent as compared with 35 per cent on the checks. Some success was had

in attracting codling moths with a mixture of molasses, water, and geranium oil. The use of sulfur dusts to check cedar rust on the apple was not highly successful, the percentages of infection being 66, 47, and 47 per cent of the untreated checks.

Leaving 5 well distributed buds in the upper 10 in. of Jonathan trees headed at 20 in. was found a satisfactory type of early training. Results with commercial fertilizers gave no evidence that any element or combination of elements had been of any significant value. Determination of nitrates in soils occupied by apple roots and in adjacent unoccupied soil showed no significant differences. Application of nitrate of soda to newly planted peach trees caused different responses according to variety, beneficial in some cases and harmful in others. Weights of air-dry substances produced aboveground by various cover crops, vetch, rye, wheat, etc., are presented and show winter vetch and rye to be in the lead.

Work with grapes indicated that the diameter of the cane is a poor index and the weight of prunings a good index to productivity in the Worden. Concord and Campbell on own roots made better growth than on Clinton and Gloire roots. Selection work with lettuce to produce stocks resistant to drop disease gave excellent results, 1 per cent in the first year and 30 per cent in the second.

[Horticulture at the Missouri State Fruit Experiment Station] (*Missouri Fruit Sta. Bien. Rpt. 1929–30, pp. [8, 9]*).—Young trees grown in soil the organic matter content of which was sustained by the growth of cover crops, the use of manure, etc., exceeded in growth and yield trees treated otherwise. In an old orchard, trees mulched with straw excelled in growth and yield but rated lowest in finish and quality of the fruit. Nitrogen fertilizers, nitrate of soda and sulfate of ammonia, were used profitably in mature vineyards but to no advantage in young plantings. Manure did not increase the yields of young vines. Strawberries responded most favorably to superphosphate at the rate of 200 lbs. or more per acre. Pruning experiments with grapes indicated that the optimum number of buds required per vine of average vigor ranges between 40 and 60 and that canes from 6 to 10 ft. long yielded better than longer or shorter ones. Yield was not materially affected by the system of training utilized. Oils gave better results than other materials in the control of San Jose scale.

The amount of manure necessary for vegetable growing, II, F. K. Crandall and T. E. Odland (*Rhode Island Sta. Bul. 225 (1930), pp. 31, figs. 6*).—In continuing experiments by Hartwell and Crandall (E. S. R., 50, p. 35) designed to show to what extent animal manures may be replaced by commercial fertilizers and green manures, data are presented on the yields of early beets, spinach, carrots, cauliflower, and eggplants grown in established rotations.

In general it was shown that green manure and commercial fertilizer may be used to advantage as supplements for animal manure. With early beets and spinach 8 tons of manure in the green manure rotation maintained yields almost as well as did 16 tons of manure without the green manure supplement. Eggplants produced the most marketable fruits on plats where 32 tons of manure and 1,500 lbs. of a 4–12–3 fertilizer were applied on the acre basis. The yields with 16 tons of manure and 1,500 lbs. of 5–12–4 fertilizer were slightly less. Commercial fertilizer gave good results with cauliflower, even when substituted for a large part of the manure. Carrots following spinach showed relatively little difference in yield whether 8, 16, or 32 tons of manure had been applied to the preceding crop. Manure with shavings

compared favorably with manure with straw. Eggplants and cauliflower responded markedly to increases in nitrogen, while carrots were little influenced. Spinach and cauliflower responded to increases in the proportion of phosphorus in the fertilizer mixture.

New and dependable varieties of vegetables, R. MAGRUDER (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 51–54*).—Annotated lists are presented.

Premature heading of cauliflower as associated with the chemical composition of the plant, W. R. ROBBINS, G. T. NIGHTINGALE, and L. G. SCHERMERHORN (*New Jersey Stas. Bul. 509 (1931), pp. 14, figs. 3*).—Catskill Snowball cauliflower plants grown in sand cultures in the greenhouse and supplied with complete nutrients in one case and nitrogen-lacking nutrients in the other showed a direct heading response to the two planes of nutrition. Plants with a limited supply of nitrogen headed prematurely, whereas those supplied with nitrate and ammonia nitrogen continued to grow and formed desirable heads.

Analyses of the two types of plants, divided into blades, petioles and stems, and roots, showed striking differences in the carbohydrate content of the two series. On a dry weight basis there was 37 per cent more carbohydrates in the stems and petioles, 188 per cent more in the blades, and 16 per cent more in the roots of the prematurely heading plants than in the corresponding parts of the other series. On a dry weight basis there was 5, 104, and 163 per cent more assimilated nitrogen (nitrate- and ammonia-free) in the roots, stems and petioles, and blades, respectively, of the vigorous vegetative plants than in the corresponding parts of the premature heading plants. None of the plants were excessively vegetative in any case. Under the conditions of the experiment premature heading was induced by limiting the nitrogen supply in the nutrient solution.

Lettuce irrigation studies, H. C. SCHWALEN and M. F. WHARTON (*Arizona Sta. Bul. 133 (1930), pp. 457–517, figs. 30*).—Using as plant material a commercial strain of New York lettuce and employing five different irrigation treatments each subdivided into cultivated and noncultivated sections, the authors reach the general conclusion that the highest yield of quality lettuce in the case of winter and spring crops is produced on a soil with uniformly high moisture content throughout the growing season. Consistent cultivation to a 3-in. depth hastened maturity as compared with shallow tillage. An abundance of soil moisture at or near the field water-holding capacity of the soil produced the highest percentage of heads. A reduction in soil moisture during the harvest period favored a high rate of heading as did also deep tillage. The percentage of bursted heads was least under conditions of uniformly high soil moisture, and the compactness of the heads was directly affected by irrigation, the more solid being produced with a sustained high water content. However, the more compact the head the greater the susceptibility to slime mold.

The root system of the lettuce plant is described in detail. The temperature most favorable for lettuce growing was found to be above a daily mean of 50° F. A difference of from 2 to 3 per cent found between the water-holding capacity of the soil and its moisture equivalent was found due to the presence of practically impervious caliche nodules. Air in the soil delayed the downward movement of water, causing an increased length of time between irrigation and the establishment of equilibrium of the soil water.

Whitewashing fruit trees to retard bud development, C. W. ELLENWOOD (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 46–51, figs. 2*).—Studies of the effect of spraying whitewash on fruit trees at the time of bloom showed a maximum

difference in time of full bloom of only 3 days between whitewashed and check apple trees, and this in only one instance. There was a slight difference in yield in favor of the whitewashed trees.

Some phases of apple growing in Rhode Island, A. E. STENE (*Rhode Island Sta. Bul. 226 (1930), pp. 36, figs. 4*).—Supplementing a historical review of orcharding in Rhode Island, there are presented the results of a survey of the present status of apple growing in the State, with suggestions as to improvement in marketing, utilization, and selection of varieties.

A study of apple containers, R. B. CORBETT and E. P. CHRISTOPHER (*Rhode Island Sta. Bul. 227 (1931), pp. 14, figs. 2*).—The examination after various periods in storage of Baldwin and McIntosh apples packed in round bottom and tub bushel baskets and in Boston and Northwest boxes showed material differences in the percentage of injury. In the case of both varieties bruising was most severe in the round bottom basket, with approximately 14 per cent of the Baldwin and 30 per cent of the McIntosh medium to severely bruised in this container. The tub bushel basket was considerably less harmful, and in the boxes bruising was reduced very materially with no choice between the two types. Stem puncture was a potent cause of injury with the McIntosh, where in the basket more than one apple in five showed such injury. In the boxes stem punctures were found on only one apple in ten. These punctures were found to be a very important entrance for decay. Some indication was secured that with the same quality of apples in all packages the Northwest box was favored on the New York City market.

Comparison of one-year-old and "June-bud" peach stock for orchard planting, J. C. C. PRICE (*Mississippi Sta. Bul. 277 (1930), pp. 19, figs. 34*).—June buds, that is, peach trees the tops of which represent the immediate season's growth from buds inserted in June, were found when compared with trees budded in August and kept dormant until the following spring to be superior in production, in survival, and for training and pruning. Of the six grades of June buds tested the 6- to 12-in., 12- to 18-in., and 18- to 24-in., are deemed the most satisfactory, although there was but little difference in growth or fruiting at the end of 5 years. June buds averaged 83 per cent less in original cost and produced 21.5 per cent more fruit than did comparable August-budded trees.

Three promising new varieties of small fruits, J. S. SHOEMAKER (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 41–46, figs. 2*).—Historical and descriptive notes are presented on the Howard Supreme strawberry, New Logan black raspberry, and Chief red raspberry.

The effect of ethylene on the chemical composition and the respiration of the ripening Japanese persimmon, W. B. DAVIS and C. G. CHURCH (*Jour. Agr. Research [U. S.], 42 (1931), No. 3, pp. 165–182, figs. 8*).—Analyses of the flesh of nonastringent and astringent persimmons collected at frequent intervals during the ripening season showed certain consistent differences between the two types. Physiologically the astringent variety Hachiya was more active in that color, total sugars, reducing sugars, and weight showed a greater increase and sucrose a greater decrease in this variety. The nonastringent persimmon Fuyu contained a greater quantity of sugar, soluble solids, and moisture.

Ethylene treatment stimulated the rate of softening, of color development, and respiration in both varieties. In the astringent variety astringency decreased and moisture increased, while in the nonastringent persimmon insoluble solids decreased while soluble solids increased. The stimulative effect of ethylene on respiration declined and the respiratory quotient $\frac{CO_2}{O_2}$ tended to increase as maturity approached, both on the tree and in storage. Changes

in storage were for most constituents simply a continuance of changes already in process on the tree. Ethylene is deemed to act through its effect on the general metabolism.

Cultivation of the banana in Porto Rico [trans. title], P. González Ríos (*Porto Rico Dept. Agr. and Labor Sta. Bul. 36 (1930), Spanish ed., pp. 58, figs. 14*).—A general discussion of cultural practices, varieties, control of pests, methods of handling the crop, etc.

DISEASES OF PLANTS

[Plant pathology at the Connecticut Station] (*Connecticut State Sta. Bul. 322 (1931), pp. 117–120, 129, fig. 1*).—Studies of the chestnut blight situation indicated that the few surviving sprouts are due to the decreasing abundance of the disease rather than to increased resistance or natural immunity.

A disease, *Helminthosporium* sp., was found to be the causal fungus in the destruction of lawn and golf course grasses. Recently seeded lawns appeared most susceptible, and the creeping bentgrass was particularly injured. The grass was matted down as if gasoline or kerosene had been poured thereon, and under the microscope the dead leaves showed black spots. Spraying with Bordeaux mixture proved beneficial.

Apple scab developed in late March rather than the usual late April, but because of the dry season infection was light on sprayed and only average on unsprayed trees. The ascospore stage of apple scab was obtained in cultures for the first time, being grown from single ascospores obtained from leaves.

Willow scab, discovered in 1927, was found to be diminishing in severity. Spraying with Bordeaux mixture or lime sulfur saved willow trees under conditions which killed all unsprayed specimens. The ascospore stage of the fungus was obtained in cultures but was not found in nature.

An elm disease found in New Haven is believed to be different from the European elm disease.

The results are presented of tests of seven different combinations of spraying materials on apple trees on the station farm at Mount Carmel, especially with relation to their injury to fruit and foliage.

Efforts to check the spread of white pine blister rust by eradicating species of Ribes were actively continued. It is stated that a 900-ft. free zone is needed in the case of the commoner species of Ribes and 1 mile in the case of the cultivated European black currant.

[Plant pathology at the Illinois Station] (*Illinois Sta. Rpt. 1930, pp. 51–53, 63, 64, 230, 231, 232–236, 239–241, 261, 263, 264, figs. 2*).—As determined by B. Koehler, at least five factors, namely, the abundance of inoculum, atmospheric conditions, susceptibility, ear covering, and ear injury, are concerned in the losses to the corn crop from ear rots. Large differences occurred in the relative importance of these different factors with the several fungi concerned. Inoculations made with *Diplodia zeae*, *Fusarium moniliforme*, *Gibberella saubinetii*, and *Basisporium gallarum* at 10-day intervals on ears of a yellow dent corn, (1) on the silk, (2) on the tip of the ear, (3) beneath the outer husks toward the butt end, (4) in the shank about 2 in. from the ear, (5) in the leaf axil subtending the shank, and (6) in the stalk about 1 in. below shank bearing node, showed that the Diplodia inoculations were the only ones to be effective throughout the entire period and by all the methods employed.

Koehler and J. G. Holbert found that disinfectant treatments of nearly disease-free seed corn increased the yield when the seed was planted early in May but that later plantings gave no increase. On average farmer's seed, the

treatments increased the yield by about 3 bu. per acre. Greater benefit was secured when corn followed corn than when corn followed legumes. In some tests treated corn plants stood more erect than did the untreated.

Evidence was obtained by Koehler that dust treatments were more effective for the control of oats smut than was the old standard formaldehyde and at the same time were simpler in application. Among the effective dusts were Smuttox, certain inorganic mercury dusts, and Ceresan.

A treatment which makes use of what are known as flotation sulfurs was found by H. W. Anderson to be a satisfactory substitute for lime sulfur in the control of apple scab. Lead arsenate used alone gave 50 per cent control, indicating that this substance has fungicidal value.

In experiments in a commercial orchard near Barry, in which plats were laid out in triplicate and some of the new sprays were compared with old standard sprays, the results were highly in favor of the new flotation sulfurs, the percentages of total scab being 8.87, 2.93, 3.51, 28.1, 52.6, and 94.9, respectively, for flotation sulfur (Thylox), flotation sulfur (Ferrox), lime sulfur, ground wettable sulfur, lead arsenate, and the control. Ferrous sulfate added to lime sulfur did not decrease russeting. The omission of one spraying one week after petal fall in one plat decidedly increased the amount of scab.

The experiments in blister canker control conducted by Anderson over a period of eight years indicated that the removal of spore-bearing cankers from the surface of apple limbs prolonged the life of the trees and increased their productivity. The prompt cutting of diseased branches and the correct treatment of pruning wounds are deemed necessary measures.

No success was obtained by Anderson in an attempt to discover the causal organism for apple measles, a disease which recently appeared to a serious degree in Illinois. Red Delicious was found particularly susceptible.

The breeding of pears possessing resistance to fire blight, leaf blight, and winter injury was continued by Anderson. Much variation was observed in *Pyrus ussuriensis* seedlings in their relative susceptibility to the three types of injury, so much so that only 10 or 15 out of more than 100 trees possesed sufficient resistance to all three to be considered promising.

An oil-sulfur combination equally as effective and more pleasant to use than lime sulfur was developed by Anderson for the control of leaf curl of the peach. Brown rot control was found to depend primarily on the control of insect pests. Wettable sulfurs used at a minimum dilution of 6 lbs. to 100 gal. of water checked brown rot. Flotation sulfur proved the most effective type. Certain oil-sulfur-lime dusts were successfully applied and found to possess better sticking qualities than the usual lime and sulfur dusts.

For the control of bacterial spot of the peach, Anderson found that a spray consisting of zinc sulfate-lime and combinations of this with other materials gave some measure of control. Bacterial spot was particularly injurious to Elberta and J. H. Hale, practically eliminating the latter variety as a commercial peach.

As reported by F. F. Weinard, a light coating of sulfur dust is highly effective in checking black spot and mildew of greenhouse roses, especially when used as an adjunct to sulfur placed on the heating pipes. Sprays were more effective than sulfur dust in checking black spot but discolored and apparently hardened the foliage.

For the production of healthy gladiolus corms, Weinard and S. W. Decker found it advisable to discard all badly diseased corms at planting, to treat scabby stock before planting with a mercury solution, and to finally handle the corms carefully at digging time. Bacterial scab was the most prevalent

disease of the gladiolus, with hard rot and Penicillium mold appearing commonly in storage. Varieties apparently differed in their susceptibility to these diseases, and sandy soil was desirable in producing healthy stock.

[Plant pathology at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 27, 28, 39–41, 60–62*).—The dust disinfectants, Sterocide, Semesan Jr., and Merko, controlled dry-rot seedling blights of corn in 1928, though the beneficial results were not as marked as in 1927 because of the more favorable growing conditions.

Ceresan gave practical control of barley stripe and covered smut, of loose and covered smuts of oats, and of bunt of wheat. Corona Oat Dust gave practical control of both oat smuts. Copper carbonate and Copper Carb gave practical control of wheat bunt only.

A dwarfing disease of the onion prevalent in the Pleasant Valley district was controlled by the use of disease-free sets and mother bulbs.

Soggy breakdown was again severe in Grimes and Wealthy apples stored at 30 and 32° F. A delay up to four weeks in storing apparently increased susceptibility, but beyond four weeks' delay apparently reduced susceptibility. Grimes apples held six weeks at 50° were apparently no longer susceptible to soggy breakdown but displayed increased susceptibility to scald. Golden Delicious was found to be fully as susceptible as Grimes to soggy breakdown.

Excessive callus development in grafted nursery stock was greatly reduced by simply inserting the tip of the scion in the stock and wrapping the union with adhesive tape. One-year apple grafts thus prepared showed remarkable freedom from crown gall as compared to those handled by the old method.

Of a total of 23 paint preparations applied to the bark tissue, none caused injury or retarded healing. Painting the entire lower trunks of older trees caused no apparent injury. Paints with a tar base were invariably injurious, whereas those with an asphalt base caused little or no injury. One or two commercial paints proved highly promising.

The yields from corn seed affected with *Basisporium gallarum* were increased as much as 20 per cent by treatment with mercury compounds. Laboratory trials, using a modification of the visible root sand culture method, gave accurate measurements of the value of seed corn treatments within a period of two weeks.

Studies of *Diplodia zeae* spores showed germination to occur between 16 and 40° C., with 33° (91.4° F.) as the optimum. The best germination was secured with fully mature but not old spores. A high percentage of the spores lost their viability in eight weeks.

The onion disease, yellow dwarf, was found to be due to a filtrable virus. In 1928, infection in the Pleasant Valley region ranged from 35 to 95 per cent. On the crop grown from sets there was noted an early and a late occurrence of the disease, the former resulting from infections of the previous year and the latter from infections transmitted early in the current season. The early infection was most serious to the commercial crop. Greenhouse tests of growers' sets showed infections ranging from 0 to 95 per cent and indicated the value of using disease-free stocks.

Diseases of plants (*Kansas Sta. Bien. Rpt. 1929–30, pp. 97–103, 147*).—A limited study of barley stripe disease indicated that Ceresan gives satisfactory control, reducing infection to less than 1 per cent as compared with over 10 per cent in control plants.

At least two physiologic forms of loose smut of oats were found, one of which attacked Kanota and Fulghum, hitherto believed resistant. Ceresan, Oat Dust, and Smuttox gave almost complete control of oat smut.

Copper carbonate and sulfur dusts gave effective control of sorghum kernel smut. Millet smut was controlled by copper carbonate but not by sulfur dusts. Several distinct forms of *Sphacelotheca sorghi* were observed, three of which were identified and described. Certain strains of milo, hegari, and feterita hitherto immune or resistant were susceptible to some of the physiologic forms. Several Red Amber×feterita hybrids proved resistant to the three described forms.

Sorghum rust (*Puccinia purpurea*) appeared abundantly in 1927 and 1928. Distinct differences in susceptibility were noted, and in very susceptible plants the rust caused premature death of the leaves.

Sharp differences were noted in the susceptibility of sorghums to leaf stripe (*Bacterium andropogoni*).

Inbred lines of corn displayed fixed reactions to smut infection, some being free and others extremely susceptible. In a cross of a high×low smut line, the F_1 hybrids remained immune, and in the reciprocal cross only 1 out of 50 plants smutted. The F_1 of high×intermediate smut lines were less resistant than open-pollinated plants of the same variety. High×high smut lines were very susceptible to smut. The treatment of good quality corn seed with organic mercury compounds gave no marked benefit in stand or yield.

In feeding smutted corn and sorghum to cattle and horses, it was noted that chlamydospores of both species almost completely lost their viability in the passage through the digestive tract. Sorghum smut spores survived somewhat better than corn smut spores, but in neither case was survival sufficient to affect perpetuation to any considerable extent. The spores lost their viability in passing through the stomach, and in horses the acidity of the stomach was sufficient to prevent the germination of nearly all the spores. The animals suffered no injurious effect from the smutted corn or sorghum.

Several of the 18 to 20 per cent grades of copper carbonates, or dusts containing metallic copper, gave good control of stinking smut and are recommended for replacing the higher grades. Very badly smutted wheat was completely freed of smut by the use of copper carbonate for two successive years.

Several distinct physiologic forms of wheat bunt were discovered and are believed to be the cause of outbreaks of the disease in recent years. In a uniform winter wheat bunt nursery, where smut secured from six States was used, it was found that Minturki C. I 6155, Minturki×Bel-Buffum C. I. 8033, and Oro C. I. 8220 were the most resistant varieties.

Fairly good control of take-all of wheat was obtained by the use of fertilizers of an organic nature, especially chicken manure, and sweetclover and alfalfa as green manure. Inorganic fertilizers either had no effect or increased the virulence of the disease. If the inoculum of take-all was placed 4 in. or more below the seed, injury was slight. The heat or dryness of summer did not sterilize the upper layer of soil. No variety of wheat was found highly resistant to take-all, but some were found highly susceptible. The fungus in pure culture made its best growth under very moist conditions. H-ion concentration or carbon content of the soil could not be associated with take-all.

Corrosive sublimate was found to be the most effective treatment in controlling Rhizoctonia of the potato, with hot formaldehyde only slightly less effective. Rhizoctonia in the soil was found to be of major importance in infecting potato seed stock, with Rhizoctonia on the tubers a contributing factor. Applications of fungicides to the soil in potato rows did not mate-

rially reduce infection. Several biologic strains of Rhizoctonia were determined.

Potato scab was reduced by applying 600 lbs. of sulfur per acre to soil where cover crops of vetch or cowpeas had been turned under. Sulfur without cover crops reduced yields.

Dipping sweetpotato plants in Bordeaux mixture, mercury hydroxide, or Semesan Bel prior to planting reduced infection from stem rot by 22.5, 18.5, and 23 per cent in 1929 and increased the yields by 12, 11.5, and 11 per cent, respectively.

Septoria leaf spot of the tomato was satisfactorily controlled by spraying or dusting with Bordeaux materials.

Sulfur dusts were tested for the control of cedar apple rust and gave considerable success, with no difference between oxidizing and nonoxidizing sulfurs.

Detailed studies of resistance to leaf rust in various varieties and hybrids of winter wheat showed but few wheats that were uniformly resistant. Rust resistance was generaly recessive and depended on a single main factor. In certain cases two or more factors were apparently involved. The age of the plant was also a factor in certain varieties. Physiologic form 9 was found to be the most abundant and widely distributed form of wheat leaf rust. The disease apparently overwinters in Texas and moves northward in the spring. Overwintering may occur in Kansas and Oklahoma but seems of minor importance. Heavy autumn infections are frequent in Kansas. Rust survives the summer on volunteer wheat plants.

A serious new disease of Dwarf Yellow milo appeared at the Garden City Substation, causing the plants to turn reddish yellow in late July and to die to the ground. New shoots start from the base but shortly succumb.

Reports on diseases of plants in Ceylon during 1928, M. Park et al. (*Ceylon Dept. Agr., Tech. Rpts. 1928, pp. 9*).—This report of the mycologist and his four assistants records in 1928 for the first time in Ceylon pineapple (*Ananas sativus*) root disease (*Rhizoctonia bataticola*); custard apple (*Annona squamosa*) collar rot (*Ustulina zonata*); betel nut (*Areca catechu*) root disease (*R. bataticola*); *Buddleia* sp. collar rot (*Sclerotium rolfsii*); pigeon pea (*Cajanus indicus*) leaf powdery mildew (*Oidiopsis* sp.); grapefruit (*Citrus maxima uvacarpa*) fruit scab (*Sporotrichum citri*); *Crotalaria* spp. root diseases (*R. bataticola* and *Fomes lignosus*); *Desmodium heterocarpum* root disease (*R. bataticola*) and stem pink disease (*Corticium salmonicolor*); *Dolichos hosei* (*Vigna oligosperma*) leaf rust (*Uromyces* sp.); *Eucalyptus* spp. root disease (*R. bataticola*); blue gum (*E. globulus*) seedling stem disease (*Macrophoma* sp.); *Gliricidia maculata* collar rot (*Sphaerostilbe repens*); rubber (*Hevea brasiliensis*) stem disease (*F. lamaoensis*); *Hibiscus tiliaceus* mildew (*Oidium* sp.); sweetpotato (*Ipomoea batatas*) tuber charcoal rot (*R. bataticola*); velvetbean (*Mucuna nivea*) stem disease (*Sclerotium rolfsii*); tobacco (*Nicotiana tabacum*) stem disease (*R. solani*) and mosaic; rice (*Oryza sativa*) leaf spot (*Helminthosporium oryzae*); *Pentas carnea* stem disease (*R. solani*); avocado (*Persea gratissima*) root disease (*R. bataticola*); bean (*Phaseolus vulgaris*) ashy stem blight (*Macrophomina phaseoli*), and Rodriguez bean (*P. vulgaris rodriguez*) stem and pod disease (*M. phaseoli*); and pomegranate (*Punica granatum*) fruit anthracnose (*Gloeosporium* sp.).

In addition, the host range of *Heterodera radicicola* has been extended to include *Hibiscus esculentus*, *Basella alba*, *Buddleia* sp., and *Heliotropium peruvianum*.

This report also presents general observations, an account of major and minor investigations, a list of the year's publications, and the detailed reports of the plant pest inspectors for the several divisions, all containing information regarding plant diseases.

Report of the mycologist, C. H. GADD (*Tea Research Inst. Ceylon Bul. 3 (1929), pp. 8–17, pls. 2*).—Of tea root diseases, that caused by *Poria hypolateritia* remains the commonest in upcountry districts and the most difficult of eradication. Brown rot and Ustulina diseases have been recorded rarely, owing to routine stumping. *Armillaria fuscipes*, said to have been regarded as a tropical analogue of the European *A. mellea*, was found in three upcountry districts to attack and kill mature tea bushes. *Rosellinia arcuata* was noted in nursery beds on ground recently occupied by virgin jungle. It is thought that several diseases are due to Diplodia, but that all of these are caused by *Botryodiplodia theobromae* is doubted. Successful treatment of wood rot or branch canker requires removal of discolored and even of apparently normal wood once entered by the fungus. Cases of true branch canker, *Macrophoma theicola*, have been found to be attacked also, after the branches had become weakened, by red rust, *Cephaleuros parasitica*. A die-back was found to occur where shot hole borer was very prevalent. Increased incidence is noted of *Phoma theicola* during early months, particularly March, which was very dry, though this fungus has never been proved to cause a serious disease. *Cercosporella theae*, relatively mild, appears to be correlated largely with climatic conditions. *Corticium vagum* (*Rhizoctonia solani*) caused some leaf injury, showing a few effects analogous to those of *C. invisum* and a mode of attack similar to that of black rot.

Physiological experiments on the effect of soil reaction showed benefit at 5 tons of lime per acre, but pathological symptoms after stronger applications. Tea seed showed delayed germination, supposedly due to some obscure condition presumably connected with the shell. Cracking with a hammer remedied this trouble, but the use of nutcrackers injured too many seeds.

Dadap has developed a new injury, increasing recently, due to *Heterodera radicicola* (*Caconema radicicola*). A Fusarium die-back disease is noted. The persistence of healthy trees among trees twice suffering attack suggests some form of immunity. A Septobasidium, possibly similar to or identical with *S. bogoriense*, has been found on dadap in Ceylon, apparently causing no serious damage.

Pestalozzia lupini causes a leaf disease of lupines, both in nurseries and when interplanted with tea. *Neocosmospora vasinfecta* was found in association with a wilt disease of *Tephrosia candida*. *Armillaria fuscipes*, noted as a root disease of tea, has been found also on roots of Hibiscus. A species of Fusicladium was associated with a defoliation of old Albizzias, also a Phoma with a seedlings disease of Albizzia.

The treatment of pea seed with chemical materials, L. K. JONES (*New York State Sta. Circ. 118 (1931), pp. 3*).—The results of treatments of pea seed with various protective media (E. S. R., 59, p. 52; 64, p. 744) are briefly summarized and accompanied with practical recommendations.

Damping-off of tomatoes combated by seed treatment with copper compounds, J. G. HORSFALL (*New York State Sta. Circ. 120 (1931), pp. 4, fig. 1*).—Successful methods of treating tomato seed with copper compounds to prevent damping-off in the seedling stage are briefly described as based on Bulletin 586 (E. S. R., 64, p. 647).

Gladiolus diseases, P. E. TILFORD (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 67–73, figs. 5*).—Information is presented on the symptoms, cause and spread, and control of several serious and widely distributed diseases of the gladiolus.

Germination loss of coniferous seeds due to parasites, A. RATHBUN-GRAVATT (*Jour. Agr. Research [U. S.], 42 (1931), No. 2, pp. 71–92*).—In the case of coniferous seeds germinated in contact with agar cultures of fungi, evidence was secured that poor germination of pine is due mainly to the destruction of radicles after their emergence from the seed coat but before the seedlings have appeared aboveground. Decay of unruptured seed was noted but is considered of less importance than radicle destruction as a cause of low germination.

Pythium ultimum, P. aphanidermatum, Pythiacystis citrophthora, Phytophthora spp., *Fusarium sporotrichioides, F. discolor sulphureum, F. arthrosporioides, Botrytis cinerea, Phomopsis juniperovora,* and some lines of *Corticium vagum* and *F. moniliforme* were observed to be able to decay radicles that had just emerged from the seed coats. The following fungi failed to attack radicles under the conditions of these experiments: *Cephalothecium roseum, Verticillium* sp., *Thielavia basicola, Pestalozzia funerea* (?), the small sclerotial *Botrytis* spp., and some of the *Corticium vagum* lines, *F. radicicola, F. oxysporum, F. coeruleum, F. hyperoxysporum, F. avenaceum, F. orthoceras* (?), *F. ventricosum,* three lines of *F. acuminatum,* three lines belonging to the *discolor* section of Fusarium, *Pythium artotrogus, Mucor racemosus,* and an unidentified Phycomycete.

All the available lines of *Pythium ultimum* and some of the more virulent lines of *C. vagum* gave some evidence of attacking seeds that had not ruptured, so far as could be detected with a hand lens. *P. aphanidermatum, Pythiacystis citrophthora, F. sporotrichioides,* and *Phomopsis juniperovora,* none of which have been isolated from damped-off coniferous seedlings under natural conditions, also appeared to attack unruptured seeds. Several of the other fungi gave less apparent evidence of this ability.

Observations on the behavior of *Pinus resinosa* seeds showed similar results to those secured with *P. banksiana.* In a preliminary test *Picea engelmanni* seeds appeared more susceptible to decay than either of the above pines. *Pythium ultimum* and the more virulent lines of *C. vagum* caused more apparent germination loss than any of the tested species of Fusarium except *F. sporotrichioides.*

ECONOMIC ZOOLOGY—ENTOMOLOGY

Making use of our birds, O. A. STEVENS (*North Dakota Sta. Bul. 241 (1930), pp. 40, figs. 19*).—This revision of Bulletin 195 (E. S. R., 55, p. 351) is a practical account of birds, of which about 340 kinds have been recorded from North Dakota, the greater part being summer residents spending from 4 to 7 months a year in the State. The subject is dealt with under the headings of value of birds (economic and esthetic), seasons of birds, value of a particular species, food of birds, damage caused by birds, protection against birds, causes for bird destruction, laws for bird protection, protection for rare species, making use of birds, and the identification of birds. Mention is made of practically all the forms found in the State, with particular reference to the food habits of the more common or important ones (pp. 13–39). A spring migration list is included.

Report of the entomologist, S. R. VANDENBERG (*Guam Sta. Rpt. 1929, pp. 16–20*).—In continuing the breeding work with the European corn borer parasite

Exeristes roborator (E. S. R., 63, p. 152), the mortality in the larval and pupal stages continued to be rather high despite all precautions, due to the rotting of the corn borer larvae used as food. During short periods of hot weather when the temperature in the insectary registers about 96° F., fully 75 per cent of the feeding parasitic larvae die.

Methods for rearing Spalangia parasites of the house and stable flies were improved, and losses from the fungus that attacks the fly pupae were practically eliminated. Pine shavings were found to be more satisfactory than moss as a medium for the fly pupae because they permitted the maintenance of optimum moisture conditions in the breeding jars and did not become water-logged. Liberations of the parasite were made throughout the year in practically every district, but the natural spread appears to be very slow.

The reappearance of the Vedalia predator (*Novius cardinalis*) of the cottony cushion scale, which was introduced two years previously to combat a heavy infestation of the pest, was noted.

The tachinid fly *Ceromasia sphenophori*, reported the preceding year as successfully controlling the sugarcane borer at Togcha, has apparently died out due to unfavorable field conditions.

Mention is made of a fungus disease of the papaya fruits at the station caused by *Penicillium* sp.

Observations were made of the endoparasites of poultry, brief descriptions being given of the eye worm *Oxyspirura mansoni*, the esophageal worm *Capillaria annulata*, the stomach or gizzard worm *Acuaria nasuta*, the intestinal roundworm *Galli perspicillum*, the cecum worm *Heterakis gallinae*, a tapeworm of the genus Davainea, and coccidia.

Control of insect pests (*Connecticut State Sta. Bul. 322 (1931), pp. 120–126, figs. 2*).—It is reported that the European corn borer spread widely during the summer of 1930 and is now present in every county of the State. Mention is made of the progress in draining mosquito breeding places, all but seven shore towns in the State having drained all or part of their salt marshes or made provision for it. The Mexican bean beetle survived its first winter in New England and spread further until it was well scattered over the State. The satin moth continued to spread westward. Spraying and creosoting was found to cut down old infestations of the gipsy moth and check its material spread. The Japanese beetle was discovered in five widely separated towns where it had not previously been known to occur. The Asiatic beetle appeared in July in a few places outside the quarantined area in New Haven.

In control work with the oriental fruit moth 6,000,000 specimens of the egg parasite *Trichogramma minutum* were reared by the station and distributed to 140 growers in the first year of the work, and about 12,000 specimens of the larval parasite *Macrocentrus ancylivora* were collected or reared and distributed, of which 3,000 were supplied by the U. S. D. A. Bureau of Entomology.

More than 1,000 apiaries, containing 10,303 colonies, were inspected during the year and found to be in a generally healthy condition. American foulbrood was found present in 52 colonies.

[Report of entomological investigations at the Illinois Station] (*Illinois Sta. Rpt. 1930, pp. 136–150, figs. 6*).—In cooperative studies by the station, the U. S. D. A. Bureau of Entomology, and the Illinois Natural History Survey, W. P. Flint, W. P. Hayes, J. D. DeCoursey, and G. H. Dungan report definite progress having been made in finding varieties of corn which show resistance to or tolerance of the European corn borer (E. S. R., 62, p. 352). There was a wide variation in the percentage of borer infestation between the different varieties, data on the infestation and yields of corn varieties grown in the

borer infested area near Toledo, Ohio, in 1929 being reported in tabular form. More than 200,000 individuals of an egg parasite were reared and released in the State.

The work of the year with the corn rootworm indicates that early plowing of the land may be a satisfactory method of controlling the pest in the field. There was little difference in the number of corn rootworms present under clover and no-clover rotations, but the time of plowing had an important bearing on the number of rootworms.

Flint, J. H. Bigger, B. Koehler, and J. R. Holbert found that seed treatment chemicals used for control of corn diseases do not control insect pests of corn. Details relating to the treatment of seed by certain fungicides are reported in tabular form.

In work with the codling moth, Flint, S. C. Chandler, and Bigger found that certain summer oil sprays are effective in controlling the second and third brood moths. In three years' tests the oil sprays alone or in combination with certain plant poisons have been practically as good as arsenate of lead. In most cases the oil sprayed apples had a better finish than those sprayed with the usual mixtures. The oil sprays, however, must be used carefully, applying at least two in the northern part of the State and three in the south-central and central.

A satisfactory commercial control for the plum curculio was demonstrated by Bigger as a result of five years' work in apple orchards in the western part of the State. The method consists of three to four properly timed sprays made up of 2 lbs. of arsenate of lead in each 50 gal. of spray material. In orchards where the damage from the curculio often was as high as 50 per cent, this method reduced injury to less than 6 per cent. During the past three years the curculio was controlled by making certain modifications in the established spray schedule, the method consisting in spraying with arsenate of lead at the time of the calyx, one week after calyx, and three weeks after calyx, using the poison at the rate of 2 lbs. to 50 gal. of spray material.

In work with the plum curculio on peach, by Chandler, the new oil dusts tested were highly effective. Jarring tests in unsprayed orchards carried on for five successive seasons have given the following results: "Very few curculios are present before the usual time of the chuck spray, indicating that a petal-fall spray, sometimes advised, would be of little value in the State. Practically none were present on the peach trees after harvest began, indicating that post-harvest applications practiced in some sections would be worthless in southern Illinois. Curculios were present in large numbers late in the season, there being more a week before harvest than at any other time. This would indicate the importance of the later sprays. . . . The most promising feature in connection with orchard tests was the control of plum curculio with the oil dusts applied for the oriental fruit moth. Three dusted blocks of trees receiving different combinations of lime, arsenate of lead, sulfur, calcium cresylate with oil mixed at the rate of 2 to 5 per cent by weight showed only from 4 to 6 per cent wormy fruit, as compared with an average of 33 per cent in the untreated check blocks."

In work with the fertilizer influence on onion maggot infestation, O. C. Compton and E. P. Lewis found that within certain limits egg laying increased in proportion to the increase in nitrogen or phosphorus applied, but that potash had no influence. In control work the standard Bordeaux 2 per cent boiled fish oil soap emulsion gave an increase in yield of 92.5 bu. of onion sets an acre over the untreated check plat and is the only control measure recommended.

In spray work with the onion thrips, Compton found that nicotine sprays were made more deadly by the addition of an activator for the nicotine. Penetrol, a commercial oxidized oil, proved highly satisfactory as an activator and spreader in such a spray. The addition of a small amount of oil also increased the adhesiveness and killing power of the 2.4 per cent actual nicotine dust.

Progress is reported by Compton, M. D. Farrar, and F. F. Weinard in the control of the cyclamen mite. Naphthalene flakes under newspapers gave the best results of any of the single treatments. Good commercial control also was obtained by using paradichlorobenzene balls on pots with a supplementary treatment of Nico Fume sprays.

In control work with the greenhouse leaf tyer, by Compton, the use of a sulfur-lead dust was found effective, one large rose grower having estimated that its use saved 75 per cent over the cost of old methods of control. The most effective dust for control purposes consists of 85 parts by weight of dusting sulfur and 15 parts by weight of arsenate of lead.

In tests by Compton of methods for controlling symphylids, or garden centipedes, in greenhouses, the best results were obtained by removing the old soil, thoroughly brushing and washing the benches, and applying hot lime to the wood before the new soil was put into the beds.

In work by Flint and G. L. Hockenyos a combination of toxic chemicals was found which will kill insects and earthworms on lawns and golf greens without hurting the most tender grasses.

[Work in entomology at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 34, 35, 63, 64*).—In the course of analytical studies of nectar hundreds of samples were gathered from numerous species of plants visited by the honeybee and their sugar content determined. The results show that in general the sugar content of nectar from a given source varies inversely as the relative humidity of the atmosphere. They indicate the desirability of selecting a territory which is high, dry, and sunny for the location of the apiary.

Brief notes are presented upon Hessian fly damage, white grubs, wireworms, and root maggots.

The investigations of the life history and habits of the native cornstalk borers were continued (E. S. R., 61, p. 353) and expanded during the year, the stalk borer receiving the most attention and its life history being carefully worked out. The bionomics of the four-lined borer (*Luperina stipata* Morr.) was studied in detail, the life history having been carefully determined in the screened laboratory and the data obtained checked with the seasonal development in the field. Fourteen species of insects, including seven parasites and seven predators, one mammal, and three plant diseases, were recorded as natural enemies of *L. stipata*. The tachinid *Erycia myoidea* Desv. was the most important, it having been responsible for more than one-half of the total parasitism. Studies of the bionomics of the spindle worm (*Achatodes zeae* Harr.) the smartweed borer (*Pyrausta ainsliei* Heinr.), and the lotus borer (*P. penitalis* Grote) were continued; the iris borer and two other borers which frequently attack ornamental plants also received some attention.

Studies were made of the effect of temperature and relative humidity upon the development of the eggs of the stalk borer, *L. stipata*, and the iris borer, all of which pass the winter in the egg stage.

Control work was conducted with onion insects, including several species of root-feeding maggots, the onion thrips, the tarnished plant bug, cutworms, white grubs, etc. A new attractant, "diamalt," gave promising results and

seems to be better than molasses as an attractant for the adult onion maggot flies, especially those of the onion maggot, the black onion fly (*Tritoxa flexa* Wied.), and the barred winged onion fly (*Chaetopsis aenea* Wied.).

Injurious insects and other pests (*Kansas Sta. Bien. Rpt. 1929–30, pp. 103–118*).—In reporting on climate and injurious insect investigations, the results of the study of the evaporation in an alfalfa field at different distances above ground and the effect of different types of insect cages on rate of evaporation are reported in tabular form. Earlier studies have shown that the temperature of insect cages is appreciably the same as that outside. The evaporation in all cages was found to be less than the normal evaporation at the same level outside of the cages. The evaporation in the Cel-O-Glass cages was only one-third normal and in the gauze cages only one-half normal. The data obtained are considered of interest in the rearing of such insects as the chinch bug, which is especially sensitive to humidity conditions.

In reporting upon wheat insects, data are given on the distribution of the Hessian fly, its life history in the field, influence of cultural methods on insect injury, and the wheat strawworm. Similar data are given on corn ear worm studies, biological studies of the corn leaf aphid and the corn rootworm, influence of cultural systems on insect injury, studies on the common stalk borer, and the smartweed borer (*Pyrausta ainsliei* Heinr.) and its parasites.

Under the heading of fruit and vegetable insects mention is made of the study under way of the ecology, life history, and parasites of the strawberry leaf roller, and control methods, including resistant varieties. Two tachinids, *Nemorilla maculosa* Meig. and *Phorocera tortricis* Coq., were reared from this leaf roller.

Considerable progress (E. S. R., 61, p. 151) was made in the study of insects attacking the sorghums, notes on which are presented. Accounts of the progress of a study of insects attacking the roots of staple crops, insects injurious to alfalfa and allied plants, shade tree insects, codling moth investigations, resistance of crop plants to insect injury, and control of injurious mammals follow. The influence of insecticides upon the amount of soil brought to the surface by soil burrowing insects is reported in tabular form, as is the record of cankerworm emergence at Manhattan for the years 1924–1930.

Reference is made to an improved method used in rearing wireworms to adults. It was observed that insects did considerable burrowing on the plats treated with various insecticides. The results show that all the arsenicals are injurious to plant growth. Sodium cyanide and paradichlorobenzene greatly reduced the yield. Most of the sodium compounds had a deflocculating effect on the soil, rendering it more impermeable to water.

During the past biennium 18 species of Curculionidae were added to the list of those taken on alfalfa, bringing the total up to 24. Most of these are probably occasional visitors to alfalfa, and only 3 are believed to be of importance at present, namely, *Sitones hispidulus*, *Phytonomus punctata*, and the imbricated snout beetle. *S. hispidulus* is undoubtedly the most injurious and presents a real menace to the alfalfa industry. Collection data show that in the summer and fall leaf hoppers are the most abundant of the insects injurious to alfalfa. There are about 20 species commonly taken in alfalfa around Manhattan, those occurring in greatest numbers being *Empoasca fabae* (Harr.), the six-spotted leaf hopper, *Agallia sanguinolenta* (Prov.), and *Draeculacephala mollipes* (Say). The relationships between alfalfa and potato growing and *E. fabae* were made evident the latter part of June, when the alfalfa was cut, the leaf hoppers migrating en masse to the potatoes and within 3 days every potato was scorched so that all growth ceased.

The investigation of the efficiency of various dosages of lead arsenate and the relative effectiveness of certain lead substitutes for the control of the codling moth demonstrated again that dosages of 1:50 are utterly ineffective; that at 1.5:50 the margin of safety is so small as to preclude effective commercial control; that at 2:50 control is excellent where proper spraying is done, using about 12 to 15 gal. of spray to the average 20-year-old tree; and that dosages stronger than 2:50 give slightly better control, but are not sufficiently more effective to be desirable from a commercial standpoint.

Research in the field of entomology, R. A. COOLEY ET AL. (*Montana Sta. Rpt. 1929, pp. 84–87*).—The statement in the abstract of this article, previously noted (E. S. R., 64, p. 241), regarding mosquito oviposition should be corrected to read, "over 5,000 eggs were obtained from one of the dominant species, *Aedes vexans* Meig."

Entomology in Puerto Rico during the past decade, M. D. LEONARD (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 141–151*).—This contribution from the Porto Rico Insular Experiment Station at Rio Piedras gives a brief review of the more important entomological activities, pure as well as applied, during the years 1921 to 1930, notes on the principal workers, and suggestions as to future lines of investigation.

The initiation of entomological extension work in Haiti, G. N. WOLCOTT (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 131–141*).—A history is given of the entomological extension work in Haiti by a former entomologist of the entomological service of the island.

[Contributions on economic entomology] (*Arb. Biol. Reichsanst. Land u. Forstw., 17 (1929), Nos. 1, pp. 67–102, pls. 3, figs. 3; 2, pp. 103–193, figs. 12, pp. 195–224, figs. 3; 3, pp. 253–272, figs. 6; 4, pp. 301–319, figs. 4, pp. 321–344, pls. 2, figs. 4; 6, pp. 459–498, pls. 7, figs. 6, pp. 499–548, figs. 10*).—The contributions relating to economic entomology here presented are as follows: Outbreaks of the Mealybug *Phenacoccus hystrix* (Bär.) Ldgr. in the Vineyard District of Moselle, Saar, and Ruwer, by H. Zillig and L. Niemeyer (pp. 67–102), including a list of 29 references to the literature; Investigations of the Life History and Control of the Spinach Leaf Miner (*Pegomyia hyoscyami* Pz.), IX, X, by H. Blunck, H. Bremer, and O. Kaufmann (pp. 103–224) (E. S. R., 60, p. 653); Methods of Testing Plant Protective Materials—II, Determination of the Adhesion of Dusting Materials, by H. Voelkel (pp. 253–272); Observations on the Distribution and Repression of the European Corn Borer (*Pyrausta nubilalis* Hbn.), by A. Hase (pp. 301–319), which includes studies of several parasites; On the Knowledge of the Parasites of the European Corn Borer (*Pyrausta nubilalis* Hb.) in the Rhine and Danube Districts, by T. Ellinger and H. Sachtleben (pp. 321–344) (E. S. R., 60, p. 651); Investigations of the Biology and Control of the European Corn Borer (*Pyrausta nubilalis* Hb.) in South Germany, II, by W. Zwölfer (pp. 459–498) (E. S. R., 63, p. 850); and A Contribution to the Biology and Control of the Beet Carrion Beetle (*Blitophaga opaca* L.), by H. Hähne (pp. 499–548) (E. S. R., 63, p. 853).

Ecotopographic maps: Their use in entomology and notes on making, F. Z. HARTZELL (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 151–157, fig. 1*).—This is a contribution from the New York State Experiment Station.

Review of United States patents relating to pest control, [January–December, 1930], R. C. ROARK (*U. S. Dept. Agr., Bur. Chem. and Soils, Rev. U. S. Pat. Relat. Pest Control, 3 (1930), Nos. 1, pp. 12; 2, pp. 14; 3, pp. 9; 4, pp. 16; 5, pp. 13; 6, pp. 20; 7, pp. 9; 8, pp. 9; 9, pp. 9; 10, pp. 10; 11, pp. 11;*

12, pp. 17).—These reviews are in continuation of those previously noted (E. S. R., 62, p. 754).

Plants reputed to have insecticidal value: Plants found in India, R. C. Roark and G. L. Keenan (*U. S. Dept. Agr., Bur. Chem. and Soils, 1931, pp. 22*).—The present paper lists 158 plants found in India that possess insecticidal properties additional to those given in the list of nearly 200 issued by Roark in 1919 (E. S. R., 41, p. 56), and revised and enlarged by McIndoo and Sievers in 1924 and listing 287 species (E. S. R., 51, p. 158).

Problems in the manufacture of liquid household insecticides of the petroleum extract of pyrethrum type, A. Weed (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 95–97*).—It is pointed out that the manufacturer of these products is confronted with a number of perplexing problems, which include (1) the concentration of the toxic constituents to be used, (2) the use of pyrethrum powder or concentrated extracts in preparing his product, and (3) the selection of satisfactory petroleum fractions and perfumes.

***An insecticidal method for the estimation of kerosene extracts of* pyrethrum,** H. H. Richardson (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 97–105, pl. 1, figs. 2*).—The author describes a method for evaluating pyrethrum extracts. "It was found that different strengths of pyrethrum extracts vary directly in the speed with which they paralyze flies. A series of similarly performed tests indicated that the reproductibility of the results is great, especially the values for speed of paralytic action. The percentage mortalities produced by such a series extended over a wider range, but statistical analysis indicated that this variation was well within the limits of errors due to random sampling. Typical paralytic curves are shown, and the value of the 50 per cent paralytic point (the time when 50 per cent of the insects are paralyzed) for making comparisons is pointed out."

Tests with nicotine activators, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 105–111*).—A series of tests was conducted with nicotine in conjunction with the following: Penetrol, Sunoco Oil, Volck Oil, commercial soap flakes, sodium oleate, potassium oleate, and calcium caseinate (Kayso). The insects involved were the spruce gall aphid (*Adelges abietis* L.), the black cherry aphid, the spirea aphid (*Aphis spiraecola* Patch), and certain brown aphids on conifers. The tests indicate the influence of a complex of factors on the results of the various sprays.

Some comparative tests with rotenone, nicotine, and pyrethrum, M. M. Darley (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 111–115*).—"Rotenone at a concentration of 1 : 100,000 as a contact poison in spray form was found to compare favorably in toxicity with nicotine at 1 : 10,000 and pyrethrins at 1 : 74,800, with Penetrol at the same concentration (1 : 200) in each spray, in tests against the false cabbage aphid (*Rhopalosiphum pseudobrassicae*) in the field and the spirea aphid (*Aphis spiraecola*) in the laboratory. Against adults of the spotted cucumber beetle (*Diabrotica duodecimpunctata*) and the Mexican bean beetle (*Epilachna corrupta*) pyrethrins at 1 : 37,400 were effective, while nicotine at 1:5,000 and rotenone at 1:50,000 were ineffective, with Penetrol at 1 : 100 in each spray. A rotenone concentration of 1 : 1,000 (plus Penetrol 1 : 200) was necessary before a mortality above 90 per cent was secured with adults of *D. duodecimpunctata*. Some preliminary tests with the common red spider (*Tetranychus telarius*) indicate that the relative toxicity of rotenone, as compared to the toxicity of nicotine and pyrethrins to this pest, is appreciably greater than its relative toxicity as indicated in the aphid tests."

Organic solvents for aiding the removal of spray residue from waxy or oil-covered fruit, R. H. ROBINSON (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 119–125*).—In this contribution from the Oregon Experiment Station it is pointed out that oil sprays and excessive wax formation on apples complicate the removal of spray residue. When certain organic solvents such as alcohol, benzol, acetone, kerosene, etc., are added to the hydrochloric acid washing solution, the residue is removed more effectively. Kerosene seems to be the most practical for the purpose.

A study of arsenical residues on apples in Pennsylvania with respect to efficient spraying practices, II, H. E. HODGKISS and D. E. HALEY (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 83–88*).—In order to ascertain the range of total arsenic on fruits at harvest, the Pennsylvania Experiment Station (E. S. R., 58, p. 254) analyzed the residues on samples of fruits from typical orchards. The analyses indicated that for the most part the total arsenic content was below the export tolerance.

A radioactive indicator method for estimating the solubility of acid lead arsenate within the alimentary tract of the silkworm, F. L. CAMPBELL and C. LUKENS (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 88–94, fig. 1*).—By the use of the radioactivator method the rate of evacuation of lead by the silkworm was determined following the administration of a known dose of acid lead arsenate and of a known dose of basic lead arsenate. It was shown that at least 25 per cent of a moderate lethal dose of acid lead arsenate goes into solution within the gut of the silkworm during its survival period. Acid lead arsenate was found to be much more soluble than basic lead arsenate within the gut.

Tests on the control of several insects attacking ornamental plants, C. C. HAMILTON (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 162–169*).—This is a contribution from the New Jersey Experiment Stations.

"The European pine shoot moth (*Rhyacionia buoliana*) was controlled by spraying infested trees during June with Penetrol diluted 1 to 200 plus Black Leaf 40 1 to 500. Three sprays were applied at intervals of a week or ten days. These sprays killed the adults hiding in the trees and the eggs laid upon the terminal twigs. The juniper webworm (*Dichomeris marginellus*) and the pine needle miner (*Epizeuxis aemula*) were also effectively controlled by means of several summer contact sprays, applied in May or early June against the larval stages before the adults had an opportunity to emerge and lay eggs on other plants. The black vine weevil (*Brachyrhinus sulcatus*), the grubs of which were feeding on the roots of taxus plants, were successfully controlled in the adult stage by means of a poison apple bait. Tests against a thrips infesting privet showed that dust insecticides were more effective than liquid sprays, and that the best materials were dusts containing nicotine tannate or ground pyrethrum flowers. Tests against the elm mite (*Eriophyes ulmi*) showed that sprays or dusts containing sulfur were much more effective than sprays containing pyrethrum extract as the active principle."

Observations on shade tree insects, E. P. FELT and S. W. BROMLEY (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 157–162*).—A brief summary of information on shade tree insects in the northeastern United States in 1929 and 1930.

Relation of environment to pear psylla infestation, F. Z. HARTZELL and F. L. GAMBRELL (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 66–71*).—In observations by the New York State Experiment Station the degree of infestation by the pear psylla was found to be related to the environment, and this led to an investigation of the factors that favored or hindered the destructiveness of the species.

It was discovered that heavily infested trees usually were located in sheltered places, and that orchards in which the insect generally was scarce were situated where they were exposed to north, northwest, or west winds. It is thought that much of this influence is confined to the autumn dispersion, at which time the migrants seek trees in sheltered places perhaps because of warmth and quiet. A part of these results may, however, be due to the action of storms which wash some of the nymphs from the trees where the latter are not protected.

Investigations aimed at reducing the cost of pear psylla control, F. Z. HARTZELL (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 71–77*).—This contribution from the New York State Experiment Station calls attention to the fact that pear psylla control is intimately related to other problems of pear production. The results of investigations show that a considerable saving may be accomplished by modifying the environment of the orchard, by the use of lubricating oil emulsions, and by decreasing the proportion of nicotine.

Aphids as vectors of leafroll among sprouting potato tubers, F. C. STEWART and H. GLASGOW (*New York State Sta. Tech. Bul. 171 (1930), pp. 21, figs. 6; abs. in Phytopathology, 21 (1931), No. 1, pp. 103, 104*).—The discovery twice during the past three years of the abundant infestation by the green peach aphid of the sprouts of potatoes purchased at grocery stores in Geneva, N. Y., has led the authors to investigate the possible importance of such infestation in the spread of virus diseases of potatoes such as leaf roll and mosaic. Attention is called to the fact that while such infestation is of common occurrence in England and Ireland, as reported by Murphy (E. S. R., 51, p. 351), by Murphy and McKay (E. S. R., 51, p. 652), and by C. L. Walton[1], it has but once before been reported from the United States—that by Schultz et al. in 1919 (E. S. R., 42, p. 47). Schultz and Folsom found in 1921 (E. S. R., 45, p. 145) that leaf roll and mosaic may be transmitted by aphids feeding on the sprouts.

In an attempt to determine what may be expected to happen when sprouting seed potatoes containing some tubers affected with leaf roll become infested with aphids, Irish Cobbler tubers free from the virus were divided lengthwise into halves. One lot of these halves was mixed with a few aphid-infested sprouting leaf roll tubers and kept in a warm room for 3 weeks. During this time the tuber pieces sprouted and the aphids multiplied and moved about freely, feeding now upon sprouts of the leaf roll tubers and now upon the sprouts of the half tubers. The other lot of halved tubers was used as a check, being subjected to the same conditions as the pieces of the first lot except that they were not exposed to aphids. At the end of 3 weeks each half tuber of both lots was cut crosswise into two pieces and all planted in 6-in. pots in a greenhouse. Within 5 weeks 90 per cent of the plants from the lot of pieces which had been exposed to aphids showed positive symptoms of leaf roll, but no signs of leaf roll were observed in any of the plants in the check lot. This is considered to show conclusively that aphids feeding upon the sprouts of seed potatoes spread leaf roll very rapidly and widely, provided the aphids are numerous.

In order to determine whether leaf roll infection entering by way of the sprouts spreads from one eye to another through the flesh of the tuber, one half of each of six large sprouting tubers was covered with cotton and cheesecloth to exclude aphids while the other half was exposed to aphids which had previously fed upon the sprouts of tubers affected with leaf roll. After-

[1] Jour. Min. Agr. [Gt. Brit.], 30 (1923), No. 9, pp. 829–833.

ward, pieces from both the covered and the uncovered portions of the tubers were planted and the plants which they produced watched for the appearance of leaf roll symptoms. Four of the tubers gave leaf roll plants from the exposed portion and healthy plants from the covered portion, showing that the infection had not spread from eye to eye through the flesh of the tuber. It is pointed out that this can not be accepted as the invariable rule until confirmed by other experiments, because the record of the other tubers was not clear. Plants from the covered portions of both of these tubers were suspected of being affected with leaf roll. It is not known with certainty that these tubers were free from leaf roll at the beginning of the experiment.

The authors recommend that seed potatoes which are sprouted before planting be examined for the presence of aphids. Special attention should be given to seed potatoes which have been stored near other vegetables; also to those which have been sprouted in greenhouses before planting, since the green peach aphid is common in greenhouses.

As regards methods of control, the experiments conducted at the station indicate that aphids infesting seed potatoes may be killed without injury to the tubers by fumigating in a tight room for two or three hours with tobacco powder of high nicotine content or with sodium cyanide, using at least 1 oz. of the former or 0.5 oz. of the latter for each 1,000 cu. ft. of space. Preventive measures include (1) keeping tubers from sprouting until near planting time, (2) avoiding the storing of seed potatoes near other vegetables in a warm place, and (3) the mixing of a liberal quantity of finely ground tobacco dust with the tubers as they are being placed in storage.

Aphids on potato sprouts, F. C. STEWART and H. GLASGOW (*New York State Sta. Circ. 119 (1931), pp. 6, figs. 2*).—This is a popular account of the investigations reported in Technical Bulletin 171, above noted.

Preliminary notes on the biology and control of the pine leaf scale, Chionaspis pinifoliae Fitch, A. G. RUGGLES (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 115–119*).—This paper is based upon studies conducted at the Minnesota Experiment Station.

The effect of temperature on feeding and development of the greenhouse leaftyer, Phlyctaenia ferrugalis Hb., G. A. FILINGER (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 52–54*).—The author has observed that slightly more food was consumed by the greenhouse leaf tyer at the cooler temperature than at the warmer. The development of the larvae varied from 11 days at a temperature of 30° C. (86° F.) to 58 days at a temperature of 15°.

Some laboratory reactions of young codling moth larvae, C. R. CUTRIGHT (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 81–83*).—In laboratory work with newly hatched codling moth larvae at the Ohio Experiment Station it was found that the increase of temperatures within seasonal ranges aids the larvae in establishing themselves in apples.

The cherry case-bearer, Coleophora pruniella Clemens, in Michigan, R. HUTSON (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 54–56*).—A report of a survey made of the present distribution and abundance of the cherry case bearer (*C. pruniella*) in Michigan, with data upon the damage inflicted.

Drouth checks corn-borer advance in 1930, W. P. FLINT, W. P. HAYES, G. H. DUNGAN, and A. L. YOUNG (*Illinois Sta. Circ. 367 (1931), pp. 8, figs. 4*).—In this account, intended as a guide to procedure in 1931, it is pointed out that varietal tests, reported upon in tabular form, show that no gain in yield results from late planting, that there is marked resistance or tolerance in some high-yielding strains of corn, that complete coverage of cornstalk débris with the plow is an important factor in control, although raking and burning may be

needed as a supplement to plowing, and that clean cropping practices are essential.

"Marked reduction in numbers of borers in the more heavily infested areas and restricted spread because of adverse weather conditions were the principal developments in the corn-borer situation during 1930. . . . The insect was not found any nearer the Illinois line than in 1929."

Additional data on the hot water treatment of Buxus, E. N. Cory, C. Graham, and G. S. Langford (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 169–171, pl. 1*).—Hot water treatment of box plants to control the boxwood leaf miner in the fall and spring showed that spring treatment is effective and safe, but that fall treatment is inadvisable although effective.

The role of yeast in life history studies of the apple maggot, Rhagoletis pomonella Walsh, C. L. Fluke, Jr., and T. C. Allen (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 77–80*).—The authors readily reared the apple maggot by feeding the adult flies a simple solution consisting of from 1 to 3 per cent yeast in 5 per cent honey water. Such flies lived for many days, readily mating and ovipositing in small cages in the field or laboratory.

The onion maggot, J. P. Sleesman and H. L. Gui (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 35–41, figs. 3*).—This is a practical account of the most destructive pest attacking the onion crop in Ohio, it having caused a loss of approximately $1,000,000 in the Hardin County marshes in 1928. It is pointed out that a 2 per cent lubricating oil emulsion in combination with a 4–6–50 Bordeaux, applied at the rate of 150 gal. per acre under 20 lbs. pressure, has been found effective in combating the onion maggot. The formula recommended consists of lubricating oil emulsion 1.5 gal., copper sulfate 4 lbs., hydrated lime (300 mesh) 6 lbs., and water 48.5 gal. Spraying should commence as soon as the onions can be readily observed in the row, and be repeated three or four times at weekly intervals.

The Mexican bean beetle, H. L. Sweetman (*Wyoming Sta. Bul. 176 (1931), pp. 23, figs. 12*).—This is a report of a study of the Mexican bean beetle, first found in Wyoming in 1924, at which time it was causing considerable damage to cultivated beans, made with a view to determining the probabilites of its becoming a serious pest in the State.

It was found that the pest is thoroughly established at Wheatland, and that the average moisture condition is the most important single factor in limiting dispersal and abundance, thus preventing it from spreading to the dry land farm areas. Beetle injury is noticeable and frequently severe in the irrigated district at Wheatland, showing that the insect is a potential danger to the bean-growing industry if suitable climatic conditions develop.

The broods of the plum curculio, Conotrachelus nenuphar Herbst, in Delaware, L. A. Stearns (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 62–66*).—A study of the bionomics and control of the plum curculio by the Delaware Experiment Station indicates that climatic factors, notably temperature and precipitation, may not be the primary agencies contributing to the development of two broods within a certain year, and apparently warrant a suggestion concerning the possible existence of one and two-brooded strains of this insect.

Nicotine in the control of ecto-parasites of poultry, F. C. Bishopp and R. D. Wagner (*Jour. Econ. Ent., 24 (1931), No. 1, pp. 56–61*).—The results obtained with nicotine sulfate in combating the feather mite (*Liponyssus silviarum* Can. & Fanz.) and the chicken mite are summarized, the series of tests conducted being reported. This treatment is said to be effective for the fowl tick, and when applied with reasonable care there are no serious effects on the fowls.

ANIMAL PRODUCTION

[Animal nutrition studies at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 29–31*).—The results of two studies are noted.

Earthy phosphates as mineral supplements.—To determine the toxic effect of earthy phosphates, duplicate feeding tests were conducted with rats using 6 such products fed at levels of 2.5 and 1 per cent of a ration of corn, tankage, linseed meal, and salt. Check lots were fed bone meal at the same levels. The phosphates used were 3 types of rock phosphate, 2 brands of superphosphate, and 1 phosphatic limestone. The first 5 products all produced approximately the same fluoride poisoning. The toxic effect of the phosphatic limestone appeared to be somewhat less than those produced by the other phosphates.

Toxicity of calcium fluoride in the ration.—It has been found that three generations of rats could be produced when calcium fluoride was fed at a 0.1 per cent level, and four or more generations when fed at a 0.05 per cent level. During the same period, however, seven generations were produced on the same basal ration.

Effect of age and nutrition on the calcium phosphate/calcium carbonate ratio in the bones of cattle, W. M. Neal, L. S. Palmer, C. H. Eckles, and T. W. Gullickson (*Jour. Agr. Research [U. S.], 42 (1931), No. 2, pp. 115–121*).—In an effort to determine the changes induced in the skeletal structure of cattle by different planes of mineral nutrition, the Minnesota Experiment Station analyzed the skeletons of cattle reared or maintained on rations which gave no evidence of mineral deficiencies, on rations deficient in phosphorus, or on similar rations later supplemented with sodium or calcium phosphate, and also the bones of young animals that had been on test to determine the mineral requirements for growth.

In all cases the residual calcium: residual phosphorus ratio of the bones of cattle was approximately the same as the calcium: phosphorus ratio of tricalcium phosphate, and the ratio was not affected by calcium or phosphorus deficiencies in the ration. The above ratio is for the calcium and phosphorus which do not occur in the bone as calcium carbonate or trimagnesium phosphate.

The calcium phosphate: calcium carbonate ratio in the bones of dairy cattle was affected by age and nutrition. Age decreased the ratio, as did also a phosphorus deficiency, but feeding a phosphorus supplement permitted the recovery of a normal ratio. Rations high in phosphorus may cause a high ratio. There were indications that either an increase or a decrease in the proportion of phosphate in the skeleton was the result of calcium deficiency. The ratio of calcium phosphate to calcium carbonate in two animals on a high calcium ration was normal when the animals were slaughtered at 12 months of age.

[The proteins of cottonseed and linseed meals] (*Illinois Sta. Rpt. 1930, p. 79*).—In studies by W. W. Braman with pairs of rats and rations containing equal percentages of protein, fiber, and fat, rats fed linseed meal gained 21 per cent faster during an 8 weeks' test than rats receiving cottonseed meal.

Chopping hay for livestock and steaming or predigesting feeds (*Wisconsin Sta. Research Bul. 102 (1930), pp. 32, figs. 5*).—The results published in this bulletin are divided into several parts.

Chopping soybean hay for dairy cows, I. W. Rupel, B. H. Roche, and G. Bohstedt.—The average results of three trials (E. S. R., 56, p. 772) show that the difference in gains of cows fed whole and chopped soybean hay was negli-

gible. *The cows fed whole hay consumed 2,219.6 lbs. of hay for each ton of* chopped hay used. Disregarding the difference in concentrates and the 1.65 per cent difference in milk production, chopped hay was worth 10.98 per cent more than whole hay. The whole hay ration required an average of 1.31 lbs. of concentrates, 1.08 lbs. of silage, and 5.09 lbs. of hay more for each 100 lbs. of 4 per cent milk produced than did the chopped hay ration.

Chopping alfalfa hay for dairy cows, I. W. Rupel, B. H. Roche, and G. Bohstedt.—A summary of three trials (E. S. R., 56, p. 772) showed that there was little difference in the feed consumption, daily gains, and milk production of cows fed whole and chopped alfalfa hay. It is concluded that the value of the hay was not increased and no saving was made by chopping alfalfa hay for dairy cows.

Chopping alfalfa hay for beef cows and suckling calves, J. G. Fuller, B. H. Roche, and G. Bohstedt.—Neither beef cows nor their calves showed any marked difference in gains or feed requirements per unit of gain from the chopping of alfalfa hay (E. S. R., 59, p. 66).

Chopping timothy hay for work horses, B. H. Roche, J. G. Fuller, and G. Bohstedt.—Horses fed a ration of whole timothy hay and oats gained an average of 6.8 lbs. per head during two 8-week periods, while those receiving chopped hay and 10 per cent less grain lost 19.2 lbs. per head (E. S. R., 61, p. 163).

Predigesting alfalfa hay and corn fodder for dairy cows, I. W. Rupel, B. H. Roche, and G. Bohstedt.—The feed consumption of dairy cows receiving a predigested ration and a normal ration was approximately the same, as was also the milk production and the amount of feed required to produce 100 lbs. of milk (E. S. R., 61, p. 169).

Predigesting timothy hay and oats for work horses, B. H. Roche, G. Bohstedt, and J. G. Fuller.—Feeding predigested hay and oats to work horses in two studies was found to be far from an economical method of feeding horses (E. S. R., 59, p. 70).

The cost of chopping and grinding hay, F. W. Duffee and B. H. Roche.—The factors controlling the cost of chopping or grinding hay are discussed in this section. The average cost per ton to medium fineness was $2.77.

A method for the preparation and analysis of representative samples from the bovine skeletal structure, W. M. Neal and L. S. Palmer (*Jour. Agr. Research* [*U. S.*], *42* (*1931*), *No. 2*, *pp. 107–113*, *figs. 2*).—In this paper from the Minnesota Experiment Station, the authors describe a method of preparing bone samples for analysis which eliminates much labor, reduces the size of the sample, and gives analyses comparable with those for the whole bone. The femur, humerus, and sixth and eleventh ribs from the right side of the carcass are used for analyses. Data are presented to show that the longitudinal sections of these bones constitute representative samples of the skeletal structure.

[**Quality of meat studies**] (*Illinois Sta. Rpt. 1930*, *pp. 75–77*).—The results of two studies on this project (E. S. R., 62, p. 363) are noted.

In a study by H. P. Rusk, H. H. Mitchell, T. S. Hamilton, S. Bull, and F. C. Olson, a lot of 4 steers were full-fed and exercised on a treadmill one hour daily from February 13 to June 15. A similar lot of non-exercised steers were so fed that their gains and condition approximated those of the exercised steers. The average daily gains per head were 2.56 lbs. for the steers not exercised and 2.33 lbs. for the exercised steers. The latter steers required 17 per cent more grain and 10 per cent more roughage than the others per unit of gain. Each exercised steer walked an average of 3.63 miles

per day at the rate of 4.13 miles per hour. There was no significant difference in dressing percentage, carcass grade, percentages of lean, fat, and bone, cutting percentages, size of internal organs, color of lean, firmness of fat, toughness, or chemical composition of the two lots. The glycogen content of a sample from the round analyzed immediately after slaughter was significantly higher for the exercised steers, and the creatine content of the sample was significantly lower. There was no appreciable difference in the physical appearance or palatability of the meat.

There was no significant difference in the color of the rib eye of the twelfth rib, as determined with the spectrophotometer, or in the hemoglobin content of the rib eye of 10 good to choice yearling steers which were killed by stunning and bleeding 10 minutes later and of 9 similar steers killed by the kosher method.

Factors influencing the quality and palatability of meat (*Iowa Sta. Rpt. 1929, pp. 59, 60*).—Continuing this study (E. S. R., 64, p. 368), it was found that the roasts from fattened cattle of all three ages were superior in flavor and ripening qualities to roasts from animals slaughtered at the start of the feeding period. The roasts from 2-year-old and yearling steers were more juicy and had a more desirable flavor than those from calves.

The influence of feed on the color, chemical composition, and cooking quality of the meat of grass-fat cattle (*Kansas Sta. Bien. Rpt. 1929–30, pp. 70–72*).—Continuing this study with the same type of cattle (E. S. R., 61, p. 160), 3 lots of 8 head each were fed as follows: Lot 1, shelled corn and bluestem grass hay in dry lot, lot 2, ground corn on bluestem pasture, and lot 3, bluestem pasture alone.

It was found that the color of the beef brightened rapidly during the first few minutes after cutting and continued to do so for about 3 hours. There was little difference in the color or degree of brightening of the various cuts studied. These studies indicate that cattle grazed on bluestem pasture do not produce dark-cutting carcasses. Supplemental feed increased the finish of cattle, but had no influence on the color of the meat. The cattle pastured on bluestem alone produced more desirable beef than those fed corn and hay in dry lot. Cooking tests showed that beef produced on bluestem pasture was palatable, well flavored, and had a very desirable aroma, and when other factors were equal there was apparently no relationship between the color of the raw meat and the color, quality, and palatability of the cooked meat. The beef produced on bluestem pasture "ripened" satisfactorily.

Chemical analyses showed that the blood of animals on grass was slightly higher in hemoglobin and calcium content than that of animals in dry lot. Animals having a low blood calcium content were without exception nervous and excitable. It was found that the fatter the animal the less moisture the fat contained, and that the iodine number was inversely proportional to the moisture content of the original fat, but the moisture content of the original fat was directly proportional to the melting point. The calcium content of the outside fat appeared to have a relationship to the degree of unsaturation, melting point, and moisture content. A similar but less pronounced relationship existed in the case of fat from the entire sample. Meat ripened 30 days had approximately 60 per cent of the collagen content of fresh meat. The average muscle hemoglobin content was 0.4584 per cent for animals on grass alone, 0.4164 for those on corn and grass, and 0.396 per cent for those in dry lot.

A study of the preparation of meat for cooking showed that the waste for rounds prepared as Swiss steaks was less than 25 per cent, for chuck, brisket,

ribs, and rump from 25 to 50 per cent, and for plate and flank more than 50 per cent. Shrinkage from cooking for meat prepared without liquid ranged from 16 to 25 per cent. The serving weight of sirloin, round, and rib was about 60 per cent and of rump 45 per cent of the original weight.

[Beef cattle studies in Illinois] (*Illinois Sta. Rpt. 1930, pp. 69–75*).—Most of the earliest studies (E. S. R., 62, p. 361) have been continued by H. P. Rusk and R. R. Snapp.

Ear corn silage becomes more than a salvage plan.—In this test, ear corn silage cut the first week in September, ear corn silage made three weeks later, and corn-and-cob meal from mature corn were fed to three lots of 15 calves each. In addition to the corn all the lots received cottonseed meal and alfalfa hay, and lot 3 received oat straw. The average daily gains were 2.23, 2.12, and 2.1 lbs. per head in the respective lots. The selling price, profit per head, and return for each bushel of corn fed were all favorably affected by early harvesting. In total gain per acre, the ripe corn was superior to the extent of 4 per cent.

Steers do better on stover silage with oats added.—Two lots of 21 calves each, averaging 458 lbs. per head, were fed during a 119-day wintering period on normal corn silage and green stover silage, respectively. In addition each calf received 2 lbs. of clover hay and 1 lb. of cottonseed meal per day, and oats were fed to lot 2 in amounts representing the shelled corn equivalent of the normal silage consumed by lot 1. The average daily gains were 1.36 and 1.33 lbs. per head in the respective lots. Both lots were in good health and in excellent condition for summer feeding on grass at the end of the wintering period. Total feed cost per head for wintering was $1.15 higher in lot 2 than in lot 1.

Mixed hay inferior to silage for fattening calves.—A lot of 10 steer calves on a ration of shelled corn, cottonseed meal, corn silage, and alfalfa hay made an average daily gain of 2.37 lbs. per head and returned a profit above feed costs of $21.53. A similar lot receiving shelled corn, cottonseed meal, and mixed hay gained at the rate of 2.18 lbs. per head daily and returned a profit above cost of $10.60.

Two lots of steer calves were fed for 168 days on a ration of shelled corn and cottonseed meal 7 : 1, plus clover hay in one lot and corn silage and 2 lbs. of alfalfa hay in the other lot. The calves receiving the dry roughage gained 2.31 lbs. per head daily, while the calves receiving silage made an average daily gain of 2.12 lbs. per head. There was no significant difference in the cost of gains.

Calves utilize farm wastes if proper methods used.—Two lots of calves were fed corn silage and stover silage, respectively, with cottonseed meal and mixed hay during a 133-day winter period, and were then divided into 4 lots and fed on pasture for 172 days. During the winter period the respective lots gained 1.16 and 0.65 lb. per head daily at a total feed cost of $15.22 and $10.15 per head. During the summer 3 lots received corn and cotonseed meal on bluegrass, red clover, and sweetclover pasture, respectively, while the fourth lot was grazed on sweetclover only until midsummer and then finished in dry lot. The average daily gains during this period were 2.17, 2.47, 2.27, and 2.09 lbs. per head in the respective lots. Cattle that received corn silage during the winter made an average daily gain of 2.04 lbs. per head while on pasture, while the green stover silage cattle gained at the rate of 2.29 lbs. per head daily on pasture.

[Beef cattle studies in Kansas] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 68, 69, 70*).—The results of three studies are noted.

Investigations in the use of silage for fattening beef cattle.—A duplication of the test of various protein supplements in fattening rations, previously noted (E. S. R., 63, p. 465), showed that in rate of gain the lots ranked in the following order from highest to lowest: 7, 6, 3, 4, 5, 2, and 1, while in return per steer they ranked 7, 6, 5, 3, 4, 2, and 1.

A second test, in which silage was compared with silage and hay, showed that the rate of gain, selling price, and margin per steer was not significantly different over a period of 2 years.

Methods of utilizing native pasture in beef-cattle feeding.—It has been found that the method of purchasing calves in the fall, wintering well, grazing without other feed to August 1, and then full-feeding for approximately 100 days in dry lot produces highly finished light-weight cattle at an advantageous marketing time, and allows the use of a maximum of roughage and a minimum of concentrates.

A study of pasture values and pasture methods for horses, cattle, sheep, and swine.—Bromegrass planted on upland in 1925 was sod bound and made little growth during 1928. The same area seeded to sweetclover furnished pasture for approximately one head of cattle per acre for the entire grazing season. Orchard grass produced twice as much hay per unit of area as bromegrass. A 60-acre pasture of half bromegrass and half orchard grass furnished pasture for from 20 to 40 head of mature cattle from April 15 to December 1.

Deferred breeding of beef cows, R. Withycombe, E. L. Potter, and F. M. Edwards (*Oregon Sta. Bul. 271 (1930), pp. 18, figs. 8*).—Concluding this study (E. S. R., 64, p. 366), it was found that calving at 2 years of age reduced the percentage of calves produced by the same cows when 3 and 4 years old, but not when 5 and 6 years of age. However, the reduced calving percentage did not offset the value of the calves produced. At 6.5 years of age cows that had first calved as 2-year-olds had produced an average of 0.7 calf more during their productive life than cows first calving at 3 years of age. The birth weight of calves and the rate of gain to weaning time apparently increased with age of dam up to at least 5 years old. The size of the calves produced in subsequent years was not affected by the early breeding of the dam. The 2-year-old heifers suckling calves weighed 200 lbs. less than the dry heifers of the same age, but this difference was reduced to less than 100 lbs. when the animals reached 4 years of age.

Light or heavy winter feeding did not alter the effects of early breeding, nor did the addition of silage or barley to alfalfa hay produce any changes. Straw could be satisfactorily substituted for a part of the alfalfa hay when used at the rate of 1.5 lbs. of straw for each pound of hay. Silage at the rate of 2 lbs. for 1 lb. of hay also made a satisfactory substitute for part of the alfalfa hay.

The cows which produced their first calves as 2-year-olds made a profit of $36.15 more per head in 4 years than the cows calving first as 3-year-olds. A two-thirds ration of hay for winter feeding was distinctly more profitable than a full ration. Heifers calving at 2 years of age showed a profit of $49.44 per head when wintered on straw and alfalfa hay, while those calving first as 3-year-olds and wintered on a full feed of alfalfa hay showed a loss of $36.10 per head.

[Lamb studies in Illinois] (*Illinois Sta. Rpt. 1930, pp. 90–92*).—Two experiments by W. G. Kammlade are briefly noted (E. S. R., 62, p. 364).

Texas lambs, averaging approximately 53 lbs. per head, were divided into 6 lots of 25 head each and fed for 28 days on pasture without grain and for 98 days in dry lot. Lots 1, 3, and 5 were hand-fed whole feeds and lots

2, 4, and 6 were self-fed ground feeds. Lots 1 and 2 received corn and alfalfa hay; lots 3 and 4, corn, cottonseed meal, and alfalfa hay; and lots 5 and 6, corn, oats, and alfalfa hay. The average daily gains on pasture were 0.21, 0.24, 0.22, 0.22, 0.19, and 0.24 lb. per head, and in dry lot 0.3, 0.28, 0.35, 0.35, 0.32, and 0.23 lb. per head in the respective lots. Self-feeding in this comparison failed to show any advantage over hand-feeding. The Texas lambs failed to put on as good a finish as black-faced lambs from the northwest in previous years. Adding cottonseed meal to a corn and alfalfa hay ration increased the rate and cost of gains. Cottonseed meal had a ton value equal to 42 bu. of corn and 1.1 tons of alfalfa hay.

In the second test 2 lots of 41 Corriedale ewes each were fed for 84 days on sheaf oats and clover hay. The ewes in lot 1 received approximately 0.5 lb. of oats daily, while lot 2 received half as much. About 6 weeks before the average lambing date, both lots were fed a small amount of shelled corn. Good, strong lambs were dropped in both lots, and there was no significant difference in birth weights or vigor. The sheaf oats and hay proved adequate for the needs of the ewes during the first part of pregnancy, but the ewes gained little in weight.

[**Swine studies in Illinois**] (*Illinois Sta. Rpt. 1930, pp. 81–89, fig. 1*).—Most of these studies have been continued (E. S. R., 62, p. 365).

In a study of quick-gaining trait in pigs by W. E. Carroll, G. E. Hunt, and E. Roberts, fourth-generation pigs have been produced from rapid- and slow-gaining ancestors, but the litter making the fastest gains and the one making the slowest gains were sired by the same boar. The dam of the fast-gaining litter was a slower-gaining sow than the dam of the slow-gaining litter.

Carroll, Hunt, and Roberts found that there was no marked difference in the rate of gain to market weight of purebred and crossbred pigs farrowed in the same litter.

In an effort to prevent milk anemia in suckling pigs, Carroll, Hunt, and T. S. Hamilton added iron salts to the dry feed of some litters as soon as they showed any inclination to eat, while with other litters the udder of the sow was brushed with a solution of iron and copper salts. The blood of the pigs was tested for hemoglobin and the cell volume determined. Adding an iron salt to the feed was not effective for preventing milk anemia. However, the udder treatment started soon after farrowing was always effective and prevented anemia during the entire suckling period. For late-farrowed litters a solution of iron salts only also proved to be effective.

Two tests were conducted in a study by Carroll and Hunt in an effort to develop the oats rations for pigs. In test 1, 3 lots of 20 pigs each, averaging 63 lbs. per head, were fed to an average final weight of about 200 lbs. on the following rations: Cracked corn; cracked corn and whole oats 2:1; and cracked corn and finely ground oats 2:1. All lots received a protein supplement of tankage, linseed meal, and alfalfa meal 2:1:1. The average daily gains were 1.24, 1.32, and 1.27 lbs. per head, and the feed required to produce 100 lbs. of gain was 458, 518, and 456 lbs. in the respective lots.

In the second test 4 lots of 20 pigs each, averaging 60 lbs. per head, were fed to an average final weight of about 204 lbs. on cracked corn and cracked corn and finely ground oats in the proportions of 3:1, 2:1, and 1:1, respectively. Each lot also received the same protein supplement as in the first test. The average daily gains were 1.23, 1.27, 1.28, and 1.19 lbs. per head, and it required 448, 454, 468, and 461 lbs. of feed to produce 100 lbs. of gain in the respective lots.

In a test with hull-less oats, it was found that they were worth from 36 to 52 per cent more than corn for fattening pigs.

In a study of calcium supplements for swine by Carroll, Hunt, and H. H. Mitchell, 24 pairs of pigs, averaging from 53 to 80 lbs. initial weight, were fed individually on a calcium-deficient ration of corn and soybean oil meal plus salt and cod-liver oil, and the test was terminated when the pigs reached approximately 175 lbs. in weight. Eight pairs were used to compare limestone with steamed bone meal, eight pairs to compare rock phosphate with pure tricalcium phosphate, and eight pairs to compare a mixture of tricalcium phosphate and calcium fluoride, containing as much fluorine as rock phosphate, with pure tricalcium phosphate. The calcium supplement was fed so that each pig received 5 gm. of calcium daily. The gain in 5 of the 8 pairs receiving limestone was somewhat slower than for the pigs receiving bone meal. Adding fluorine to tricalcium phosphate did not adversely affect the rate of gain. The rock phophate pigs in 7 of the 8 pairs gained slower than the pigs receiving pure tricalcium phosphate. Analyses of some of the bones at the end of the test showed that the bone meal produced larger bones with a higher ash content on both the fat- and moisture-free bases than limestone.

Carroll and Hunt fed whole soybeans to 11 sows during a gestation and a lactation period, while a similar lot received an equal amount of protein as tankage and linseed meal 2 : 1. Farrowing records, birth and weaning weights of the pigs, vigor at birth, and gains made by the sows indicated that the two rations were equal. In this test 3 lbs. of soybeans were apparently as effective as 2 lbs. of protein supplement.

In another test of soybeans by S. Bull, F. C. Olson, Carroll, and Hunt, 6 lots of 10 pigs each were placed on experimental rations at an average weight of 66 lbs. per head and were slaughtered at an individual weight of 225 lbs. The rations in lots 1 and 2 consisted of corn or barley 90 per cent and tankage 10 per cent; in lots 3 and 4, corn or barley 80 per cent and soybeans 20 per cent: in lot 5, barley 85 per cent and soybeans 15 per cent; and in lot 6, 42.5 per cent each of corn and barley and 15 per cent of soybeans. The average daily gains were 1.51, 1.57, 1.24, 1.04, 1.12, and 1.17 lbs. per head, and it required 422, 454, 414, 441, 484, and 500 lbs. of feed to produce 100 lbs. of gain, and 110, 104, 132, 153, 144, and 139 days to finish the pigs in the respective lots. The slaughter tests showed that all the carcasses in the lots fed soybeans graded either soft or oily.

[**Swine studies at the Iowa Station**] (*Iowa Sta. Rpt. 1929, pp. 19–21, 53, 58, 59*).—The results of several studies, some of which have been continued (E. S. R., 61, p. 363), are noted.

Trinity and modified "Big 10" for pigs on pasture.—Pigs on a basal ration of shelled corn and minerals self-fed on rape pasture ate practically the same amount of feed, gained at about the same cost, and returned similar margins when fed either tankage or tankage and linseed meal 3 : 1 as protein supplements. The lot receiving the Trinity mixture made more rapid and economical gains and returned a greater margin than either of the above lots. Another lot receiving the modified "Big Ten" mixture made the most economical gains and returned the largest margin of any lot in the test.

Oat preparations for self-fed pigs on rape pasture.—Adding whole oats to a basal ration of shelled corn, tankage, and minerals self-fed on rape pasture increased slightly the rate of gain, decreased the tankage required per 100 lbs. of gain from 37 to 25 lbs., and increased the margin per pig by 55 cts. Pigs fed ground oats in addition to the basal ration ate three times as much

ground oats as whole oats, gained slower and less economically, and the margin per pig was reduced 42 cts. Dehulled oats were consumed in large quantities and also increased the consumption of tankage and the cost of gains, and decreased the margin per pig as compared with the corn and tankage ration. However, the pigs so fed made the most rapid gains.

Feeding iron and copper to pigs, laboratory animals.—The average daily gain of pigs fed a basal ration of white shelled corn, skim milk, cod-liver oil, and salt was increased from 1.44 to 1.53 lbs. per head by the addition of a small amount of iron oxide. The further addition of a small quantity of copper sulfate increased the gains to 1.63 lbs. per head.

Type tests with swine.—Two litters of pigs containing nine and eight head, respectively, were fed as units for the 60-day suckling period and then individually to 225 lbs. on similar rations. In lot 1 the range in average daily gains varied from 1.36 to 0.85 lb. per head and the feed required per 100 lbs. of gain from 345 to 434 lbs. In lot 2 the range in gains was from 1.35 to 0.92 lb. per head daily and the feed requirements from 353 to 382 lbs. per 100 lbs. of gain.

Swine performance record—dry lot rations for swine.—The average daily gains of pigs from spring litters varied from 1.35 to 1.68 lbs. per head and the feed required per 100 lbs. of gain from 373 to 412 lbs. For fall-farrowed pigs the range in average daily gains was from 1.14 to 1.53 lbs. per head and in feed required per 100 lbs. of gain from 380 to 481 lbs. The proportion of carcass cuts was quite similar with animals slaughtered from the two groups, but there were differences in the quality of some of the cuts.

[**Swine studies in Kansas**] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 64–67, 146*).—The studies with swine have been continued (E. S. R., 56, p. 864; 61, p. 162).

Nutritive requirements of swine.—In this study two lots of gilts were fed to determine the effect of adding a vitamin B and E supplement to their ration. Lot 1 received yellow corn, tankage, alfalfa leaf meal, and bone ash, while lot 2 received the same ration except that 10 per cent of the corn was replaced by a like amount of wheat germ. During the first farrow there were 5 sows in each lot. In lot 1, 31 pigs died before they were 20 days of age, while 15 died in lot 2. In lot 1, two, and in lot 2, all of the sows were good milkers. The percentages of pigs weaned that were farrowed alive were 33.3 and 56.5, respectively. During the second farrow there were 3 and 4 sows in the respective lots, 6 and 8 pigs died before 20 days of age, all of the sows were good milkers, and 68.9 and 77.5 per cent of the pigs farrowed alive were weaned. The results indicated that some factor other than the lack of vitamins B and E was responsible for at least a part of the high death rate.

Swine feeding investigations.—These studies showed that corn gluten meal and alfalfa hay as protein supplements to corn for fattening hogs in dry lot were not as satisfactory as tankage and alfalfa hay, and that adding bone meal to corn gluten meal did not materially increase its value. Corn gluten meal on alfalfa pasture produced slower gains and at a higher cost per unit of gain than tankage. When bone meal was added to the corn gluten meal the rate, cost of gains, and finish attained were greater than when fed alone. Supplementing corn gluten meal with tankage for pigs on pasture did not increase the rate of gain, but did increase the cost of gain more than the addition of bone meal. A protein supplement of linseed meal or cottonseed meal, tankage, and alfalfa meal 1:2:1 produced somewhat greater gains, but increased the cost of gains when compared with a supplement of tank-

age and alfalfa hay. Replacing alfalfa hay with alfalfa meal did not increase the rate but did increase the feed consumed per unit of gain.

A preliminary study of a high calcium carbonate pig-fattening ration.—In this test 4 lots of 5 pigs each were fed a basal ration of shelled corn and alfalfa hay, self-fed, plus 1 lb. of shorts and 0.4 lb. of tankage per head daily. In addition the respective lots received 0, 0.25, 0.5, and 0.75 lb. of ground limestone per head daily. The average daily gains were 1.28, 1.03, 0.98, and 0.87 lb. per head, and the shelled corn required per 100 lbs. of gain was 323, 395, 421, and 470 lbs. in the respective lots.

Atlas sorgo v. corn as a fattening feed for swine.—A ration of ground Atlas sorgo, tankage, and alfalfa hay was self-fed to a lot of 10 pigs for 110 days, while a similar lot received a ration of shelled corn, tankage, and alfalfa hay. The average daily gains were 1.66 and 1.72 lbs. per head in the respective lots. The pigs in lot 1 required 373 lbs. of sorgo, 58 lbs. of hay, and 29.5 lbs. of tankage, and those in lot 2, 350 lbs. of corn, 57 lbs. of hay, and 30 lbs. of tankage per 100 lbs. of gain.

A study of experimental error in swine feeding.—A 2-year study with pigs from the U. S. D. A. field station at Ardmore, S. Dak., self-fed shelled corn and alfalfa hay plus 1 lb. of shorts and 0.4 lb. of tankage per head daily showed that the variations in rate and economy of gains were such that greater differences than are usually accepted must be secured before significant results will be obtained in hog-feeding tests.

[*Alfalfa pasture for pigs at the Garden City Substation*].—Pigs self-fed ground milo on alfalfa pasture made rapid gains and returned an average of $18.22 per ton on a hay basis for the alfalfa consumed. When fed a 2 per cent ground milo ration the return per ton of hay was $13.07.

Minerals for work horses (*Iowa Sta. Rpt. 1929, p. 22*).—A basal ration consisting of oats and yellow shelled corn 3 : 1 and timothy hay was fed to 4 teams made up of 4 horses and 4 mules. One animal in each team was fed slightly more than 0.5 oz. per head daily of a mineral mixture composed of 50 per cent of spent bone black, 47 per cent of finely ground limestone, and 3 per cent of iron oxide. While the minerals did not appear to save feed or keep the animals in any better condition, they did not have any harmful effects.

[Poultry studies in Illinois] (*Illinois Sta. Rpt. 1930, pp. 100–104*).—Some of these studies have been continued (E. S. R., 62, p. 367).

Soybean oil meal is poorly utilized feed for hens.—In this test by H. H. Mitchell and W. T. Haines, four mature Rhode Island Red hens were force-fed daily 45 gm. of soybean oil meal mixed with enough water to make a thick paste. After a 4-day preliminary period the excreta were collected for 10 successive days, and the heat of combustion determined. Of the 4.623 calories per gram of gross energy of soybean oil meal, the hens were able to utilize an average of 52 per cent. When 0.5 per cent of salt, 1.5 per cent of ground limestone, and 0.5 per cent of cod-liver oil were added to the soybean oil meal, the hens were able to utilize an average of 56 per cent of the energy.

Chickens need vitamin E to produce normal hatches.—Rhode Island Red pullets were fed a normal ration by L. E. Card, Mitchell, and T. S. Hamilton to 8 weeks of age and were then placed in a house with a board floor and wire-floored outdoor run and fed a ration which had been treated with ferric chloride in ether to destroy the vitamin E. When mated to normal males these pullets produced eggs with a reasonable fertility but which failed to hatch. Of 298 eggs laid between February 15 and April 2, 194 were fertile but only 83 de-

veloped beyond the ninth day of incubation. Of the eggs laid between March 19 and April 2 none developed beyond the sixth day of incubation. Injecting wheat germ oil and a vitamin E concentrate made from the oil into some of the eggs laid during April failed to improve the embryonic development.

From May 1 to 28 each pullet received 0.5 cc. of wheat germ oil daily. Between May 1 and 7, 43 eggs were laid, and of these 26 developed beyond the seventh day of incubation and 14 hatched. Of 70 eggs laid the following week, 60 had live embryos on the fourteenth day of incubation, and 43 hatched.

Growing chicks kept on milk diet developed anemia.—Chicks were divided into 4 lots of 25 birds each and kept on a brooder table in a test by Hamilton and Card. Lots 1 and 2 received a ration of liquid whole milk supplemented with a small amount of salt, and lots 3 and 4 received a regular chick growing ration. Lots 2 and 3 were irradiated daily with a quartz lamp, and lot 4 was exposed to sunlight every day when it was available. Hemoglobin determinations were made on blood samples weekly. When milk anemia developed in lots 1 and 2, each lot was divided into 4 groups and fed either copper sulfate, iron citrate, or a combination of the two, or used as controls. Severe anemia developed in lots 1 and 2 at from 3 to 4 weeks of age. The addition of the iron and copper salts relieved the condition, but no effect of irradiation either by the quartz lamp or sunshine was apparent.

Find demand for quality eggs is larger than supply.—Sales records kept at 25 Chicago stores in a study by Card and F. E. Elliott showed that while the margin between the highest and lowest grades of eggs varied from 10 to 17 cts. per dozen, the sale of the highest grade (U. S. specials) was relatively higher than the proportion of specials candled from regular receipts.

[Poultry studies at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 25, 26, 31, 32*).—The results of three studies, one of which has been continued (E. S. R., 61, p. 366), are noted.

Effects of moisture on hatchability.—In this study with 11,000 eggs it was found that in forced draft incubators a moisture loss of approximately 15 per cent gave the highest percentage hatchability of fertile eggs. In a rotary circulation type of machine the highest percentage of hatch was obtained with a moisture loss of from 9.5 to 10.5 per cent for brown eggs and from 9.5 to 11.5 per cent for white eggs.

Nutrition projects.—Corn properly supplemented in an all-mash feed gave good results for starting chicks, but milk in some form was necessary for best growth and development. The all-mash ration was satisfactory for from 12 to 15 weeks for chicks having free range on alfalfa.

Wire floors apparently had no value from the standpoint of feeding by the all-mash method, and the brooder management was somewhat different since more heat was required with the wire floors. Such floors increased slightly the cost of brooding, but no difficulty was experienced with sore feet or hocks.

Air requirements for poultry.—In this cooperative test between the poultry husbandry and chemistry departments, 10 pens of 10 birds each were confined in pens where the air could be measured mechanically. Under this method of confinement the all-mash system of feeding gave good results, but the feed consumption was greater than under ordinary conditions. Broodiness was increased considerably, but molting was more uniform and rapid and mortality due to coccidiosis appeared to be greater among the confined birds. Egg production was about normal, but the average egg weight was a trifle less than normal. Confinement had no apparent detrimental effects upon the fertility or hatchability of the eggs or upon the livability of the chicks.

When the carbon dioxide concentration of the air reached 85 parts per 10,000, the birds became suddenly inactive and unproductive. Holding the carbon dioxide concentration at from 75 to 105 parts per 10,000 for several weeks did not increase the tolerance of the birds to the gas.

[Poultry studies at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 87, 88, 89, 90, 91–93*).—The results of four studies, two of which have been continued (E. S. R., 61, p. 164), are noted.

Poultry flock management.—In this study with Barred Plymouth Rock hens and pullets, 392 hens' eggs were set, of which 91.5 per cent were fertile, and 62.6 per cent of the fertile eggs and 57.3 per cent of the total eggs hatched. The corresponding figures for pullets were 806 eggs, 77.7, 62.6, and 48.7 per cent.

The effect of age on the vitamin D potency of cod-liver oil.—Cod-liver oil mixed with all-mash rations at the rate of 1 per cent and stored in burlap bags in a dry, well-ventilated room for 1 year was effective for preventing rickets in chicks for 8 weeks. A 5 per cent mineral mixture also prevented rickets for the same period.

Turkey production.—Holding turkey eggs for 36 days before setting reduced the fertile eggs that hatched from 82 to 48 per cent in 1928 and from 74 to 3 per cent in 1929. The average feed consumption per turkey up to 24 weeks of age was 59 lbs. in 1928 and 61 lbs. in 1929. It was found that turkeys could be successfully fattened on a moist mash if they were not too closely confined.

The effect of inadequate rations on the production and hatchability of eggs.—A lot of 100 White Leghorn hens receiving yellow corn as the only source of vitamin A had an average production from November 1 to August 1 of 90 eggs per bird, 22 of the birds died, 81 per cent of the eggs laid were fertile, and 73 per cent of the fertile eggs hatched. The corresponding figures for a lot receiving a similar ration with 5 per cent of alfalfa leaf meal added were 98 eggs, 16 birds, and 88 and 83 per cent; for a lot receiving 10 per cent of alfalfa leaf meal, 94 eggs, 18 birds, and 88 and 88 per cent; and for a lot receiving white corn plus 10 per cent of alfalfa leaf meal, 93 eggs, 18 birds, and 88 and 86 per cent.

A study with 12 lots of 30 Rhode Island Red chicks each showed that neither a high or low room temperature, a high or low protein level, restricted or liberal room for exercise, nor solid bottom or wire bottom floors were the cause of enlarged hock joints and crooked legs in young chicks.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle in Guam], C. W. Edwards (*Guam Sta. Rpt. 1929, pp. 3–5, fig. 1*).—Three studies are noted.

Feeding test.—Continuing this feeding test (E. S. R., 63, p. 167), the cows were fed the same ration as in the previous year. The experimental periods were of 25 days' duration, with the first 5 days as a preliminary interval. The differences in milk production in favor of the imported feed mixture were 100.53, 101.26, and 78 lbs. of milk for the respective cows.

Palatability test.—A number of varieties of grasses were seeded to 0.1-acre plats, and 6 months after planting 3 calves were turned on the plats to determine the palatability of the different grasses. For the first few days the calves ate Para and paspalum grasses only, and a few days later began feeding on guinea grass. After about a week on guinea grass the animals began to eat Vasey grass, and about 6 days later Rhodes grass. During the next 20 days they showed an equal liking for the Para, paspalum, Rhodes, and Vasey grasses, but ate only small amounts of molasses grass. During the next 24

days the guinea grass was the most preferred and the molasses grass the least preferred with the other grasses grazed in proportionately equal amounts.

Matai tati disease.—Cattle pastured wholly on the red clay uplands often showed a depraved appetite and eventually symptoms of an ailment known as matai tati. This ailment was characterized by a swaying or unsteadiness of gait of hindquarters, especially noticeable in going up or down hill, and arching of the back when the animal was at rest. In some cases affected animals were unable to stand. Feeding bone meal prevented the appearance of this condition, and when fed to affected animals either improved or apparently cured them. Ground cascajo (local coral rock) also proved beneficial, although not so much so as the bone meal. Deficiency of minerals, especially lime and phosphorus, apparently caused the condition.

[Dairy cattle studies in Illinois] (*Illinois Sta. Rpt. 1930, pp. 115–124, 127–133, figs. 7*).—The results of several experiments are noted, some of which have been continued (E. S. R., 62, p. 369).

[*Inheritance of fat content in milk*].—The average fat content of the milk of 45 first-generation Holstein-Guernsey crosses in the Bowlker herd was found by W. W. Yapp to be 4.212 per cent for the first 15 weeks of their lactation period. The average fat content of the milk of 38 second-generation daughters over the same period was 4.37 per cent. When the test was extended to a period of 45 weeks the fat content was 4.822 per cent for first-generation and 4.426 per cent for second-generation animals. Milk yields were also higher for second-generation animals for the 45-week period, but 15- and 30-week periods showed little difference.

[*Color in milk*].—Upon comparison with magnesium carbonate (pure white) in the spectrophotometer, Yapp and A. F. Kuhlman found that the milk of different cows of the same breed varied considerably in the amount of yellow color present. Cows kept under the same conditions varied up and down with the change in feed. There was little change in the color during the lactation period. Cows tended to maintain the same percentage of color throughout their productive life, and there was a tendency for related individuals to show a similarity in color of milk.

[*Size of fat globules in milk*].—Measurements of the size of fat globules by M. H. Campbell and Yapp in the milk of cows at the Vermont Experiment Station and in the Bowlker herd, respectively, showed that there was a distinct decrease in the size of the fat globule as the lactation period progressed. The rate of decrease varied with individual cows as well as with the different breeds.

Covering cut corn keeps down spoilage of silage.—In this study by W. B. Nevens, three small wooden silos weer filled with 1,500 lbs. of corn each. The silage in one was covered with a single-ply roofing material and a plank cover and weighted at the rate of 15 lbs. per square foot. A second silo was covered with roofing material and enough sawdust to give a weight of 15 lbs. per square foot. The third silo, aside from thorough tramping, received no other treatment. In the first two silos, 91 and 95 per cent, respectively, of the amounts ensiled were recovered in the form of air-dry matter in good sileage, while in the third silo only 66 per cent was recovered. Some of the same corn was ensiled in cylindrical metal cans and covered with hydrated lime in varying amounts. The recovery from this treatment was only from 1 to 8 per cent greater than that from untreated silage. Covering silage with wet straw alone reduced spoilage somewhat, but was not as effective as the treatments in silos 1 and 2.

The results indicated that covering the cut corn in the silo is a practical and economical procedure. The treatment which apparently gave best results

was a covering of roofing material and sawdust at the rate of 15 lbs. per square foot.

[*Bulk in dairy feeds*].—Results of a comparison by Nevens of the bulk or volume of a number of feeds in air-dry condition with their volume after soaking in water are given in tabular form.

Importance of lactation persistency.—W. L. Gaines found that the correlation between the first and second record of cows remaining in the same herd was 0.303, while the correlation was 0.208 when the records were made in different herds. While these correlations were large enough to make it necessary to recognize persistency as a characteristic of the records of these cows, they were small enough to indicate that the factor is a less definite character than generally supposed.

Effect of different plant processes on milk.—Studies to determine whether or not such processes as pasteurizing, condensing, and drying of milk add enough copper, iron, or other minerals to affect the nutritive value of the milk were undertaken by Nevens and D. D. Shaw. The preliminary results have shown that such factors as rust on wire screens and the use of filter paper for bedding add minerals in an unexpected form in amounts sufficient to defeat the object of the experiment. To date it has been definitely determined that cod-liver oil was not effective in preventing or curing anemia. A new type of cage that apparently eliminated the sources of minerals other than those fed is described.

[**Dairy cattle studies at the Iowa Station**] (*Iowa Sta. Rpt. 1929, pp. 22–25*).—The results of four studies are noted.

Recut corn fodder v. corn silage.—A basal ration of alfalfa hay and a concentrate mixture was fed to 2 lots of 4 cows each during alternate 5-week periods. In addition lot 1 received corn silage at the rate of 2.9 lbs. and lot 2 recut corn fodder at the rate of 1.5 lbs. per 100 lbs. of live weight. While receiving the corn silage the cows produced 3.5 per cent more milk and 3.2 per cent more fat. About 3.2 per cent of the recut corn fodder was refused, while practically all of the corn silage was eaten. The dry matter in corn silage was worth 95 cts. and that in recut corn fodder 91 cts. per 100 lbs. The return over feed cost was 11.6 per cent greater when corn silage was fed.

The value of recutting corn fodder.—A comparison of whole and recut corn fodder fed during 3 alternate 5-week periods with a basal ration of alfalfa hay and concentrates showed that 23 and 12 per cent, respectively, were refused by the cows. However, the cows actually consumed 16 per cent more whole corn fodder and produced 2 per cent more milk while on this feed. Results indicated that the cost of $2 per ton for recutting was justified.

Creaming of milk in the udder.—Successive samples of milk were taken from each of several cows during the milking period and analyzed for fat. For cows that had been standing quietly for an hour before milking, there was an average increase of 0.47 per cent in butterfat in each of 10 successive portions of the milking, while the rise in fat percentage of the strippings was even more marked. When the udder was massaged before milking began, the first sample usually contained a higher percentage of fat than the samples immediately following, but the percentage in later samples and strippings was not affected. Cows exercised vigorously before milking gave intermediate results. Similar but less marked results were obtained with a milking goat. Placing the goat on its back for various lengths of time and milking in that position showed that successive samples of milk contained approximately equal percentages of fat. These results indicated that the creaming process is at least partially responsible for the differences in the fat content of foremilk and strippings.

The feed cost of raising dairy heifers.—In a study of the cost of raising 83 heifers, it was found that during the first year 48.6 per cent of the feed cost was for milk and 22.4 per cent for concentrates. During the second year the feed cost was 20.67 per cent lower than for the first year. Heifers that failed to freshen until an average age of 40.7 months cost 31 per cent more to feed than heifers that freshened at an average age of 29.8 months.

[**Dairy cattle studies in Kansas**] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 72–79, 141*).—These studies have been continued (E. S. R., 61, p. 166).

Factors influencing the mineral metabolism of dairy cows.—Milk alone did not supply all the factors for normal growth of calves for more than a few months. A nervous condition leading to spasms noted in several animals was apparently cured by the addition of a small amount of wheat germ stock to the ration. Three calves receiving a mineral supplement of 200 mg. of iron, 15 mg. of copper, and 30 mg. of manganese daily had a normal hemoglobin content of the blood of 10.59, 12.36, and 12.77 gm. per 100 cc., while those receiving milk alone had a hemoglobin content of 8.13, 8.18, and 7.19 gm. per 100 cc. of blood.

The average blood sugar content for dairy cattle of all ages was found to be 63.84 mg. per 100 cc. of blood. At birth the average blood sugar content was about 100 mg. per 100 cc., and the amount decreased gradually until the animal was about 2 years of age, when it remained at about 52 mg. per 100 cc. during the remainder of life. The breed of cattle and stage of lactation had little influence on the blood sugar content. Injecting large amounts of readily absorbable carbohydate material increased the blood sugar content over 100 per cent, while starvation decreased it to from 30 to 40 per cent.

The hemoglobin content of the blood of dairy cattle was found to be a rather uniform and constant factor, and the individuality of the animal appeared to be the most important factor influencing it. The mean content, based on a total of 335 determinations on 252 head of cattle, was 11.25 gm. of hemoglobin per 100 cc. of blood. Calves' blood ran somewhat lower in this respect than that of older animals. There were no significant variations in a group of 3 animals over a period of 11 days, and a fasting period of 14 days for 5 animals exerted no influence on the hemoglobin content.

After several months' feeding the inorganic phosphorus content of the blood of two lactating cows dropped to less than one-fourth normal. This condition was followed by symptoms of phosphorus deficiency. A check animal receiving a phosphorus supplement remained normal in every respect. The calcium content of the blood of phosphorus-deficient cows remained normal, but the hemoglobin and red blood cells of one of the low-phosphorus animels fell considerably below normal for a time. A similar but less marked change occurred in the other phosphorus-deficient animal.

Dairy cattle feeding investigations.—Using the double reversal method, two groups of five cows each were fed a basal ration of corn chop, wheat bran, and oil meal 4 : 2 : 1 plus 1 per cent of salt and 1 per cent of steamed bone meal and alfalfa hay. In addition they received sorgo as silage or as ground fodder fed on the same dry matter basis. The results indicated that the silage was very slightly superior for maintaining the live weight of the animals.

Using a total of 17 cows fed through 3 feeding periods on the same hay and grain ration and either Atlas or Kansas Orange sorgo silage, experiments showed that both silages caused the cows to gain in weight. For milk production the Atlas silage was slightly superior, while for fat production the difference was somewhat greater in favor of Kansas Orange silage.

Cows fed corn chop gained 2 lbs., while those fed corn-and-cob meal gained 6 lbs. per head. While on corn chop the cows consumed slightly more feed,

but the difference was small. For the production of milk and fat there was practically no difference in the two feeds.

There was no significant difference in the general appearance and condition of heifers raised and continued through the first and second lactations on grain mixtures containing 50 per cent of either sorgo, kafir, or corn, with the remainder of the ration consisting of alfalfa hay and sorgo silage.

Using the double reversal method, a total of 17 cows were fed through three 30-day periods on the same grain and silage ration and received in addition either alfalfa or soybean hay. While on alfalfa hay the cows averaged slightly higher in body weight than while on soybean hay. On the latter hay the cows produced 4.5 per cent less milk and 1.8 per cent less fat than while on alfalfa hay.

The average body weight of cows fed field-cured and stack-browned alfalfa hay was exactly the same. The cows receiving the brown hay produced 4.3 per cent less milk and 4.1 per cent less butterfat in spite of the fact that they received 7.6 per cent more grain mixture than the lot receiving green hay.

In another test 10 cows were fed through three 30-day periods on rations of alfalfa hay and sorgo silage plus a grain mixture of either 640 lbs. of ground sorgo heads or 400 lbs. of corn chop, 200 lbs. of bran and 100 lbs. of linseed meal. The cows gained in weight while receiving either grain mixture, and there was no significant difference in the production of milk and fat.

Silage investigations.—In this study it was found that the moisture content of green sorgo was fairly constant from year to year, but the protein content varied considerably among lots of sorgo cut during the same year. The amount of acid formed from normal sorgo during the process of ensiling varied only slightly from year to year, averaging slightly over 3 per cent.

Calf feeding investigations.—Calves were fed a basal ration of alfalfa hay, cane silage, and milk, to which was added a grain mixture of 300 lbs. of ground corn or sorgo and 100 lbs. each of ground oats, bran, and linseed meal. At 180 days of age the calves receiving corn averaged 257 lbs. per head and those receiving sorgo 251 lbs. per head.

A study of the use of fly repellents for the control of flies on dairy cattle.—Two commercial fly sprays and one home-mixed spray were efficient for repelling flies for one-half hour with barn-fed cows. The home-mixed spray was also efficient for one hour. The total milk production of sprayed cows during three 20-day periods was 5,215 lbs. and for check cows 5,270 lbs. of milk.

Dairy cattle pasturing investigations.—During a 102-day period in 1928 at the Fort Hays Substation, 13 Holstein cows were grazed on 15 acres of Sudan grass. The average daily production per cow was 21.3 lbs. of milk and 0.74 lb. of butterfat. In addition to the pasture 1.44 tons of hay per acre were cut from the field. In 1929, 16 cows were grazed from June 16 to September 26 on 13.6 acres. The average daily production per cow was 29.1 lbs. of milk and 0.97 lb. of butterfat. The pasture also furnished 1.4 tons of hay per acre.

The comparative value of kale and corn silage for milk production, I. R. Jones and P. M. Brandt (*Oregon Sta. Bul. 272 (1930), pp. 34, fig. 1*).—Concluding this series of studies (E. S. R., 64, p. 375), it was found that it required 74.6 lbs. of total digestible nutrients in hay, grain, and kale and 82.2 lbs. in hay, grain, and corn silage to produce 100 lbs. of milk. This difference in total digestible nutrients is equal to 82.6 lbs. of kale. On a green weight basis 1 lb. of corn silage was equal to 1.31 lbs. of kale for milk production and 1.39 lbs. of kale for butterfat production.

Kale gave the most economical results when fed at the rate of from 30 to 35 lbs. per head daily, and at this rate was practically equal to corn silage for

milk and fat production. The average daily gain in body weight when corn silage was fed was 0.656 lb. and when kale was fed 0.568 lb. A combination of kale and corn silage was economical for milk and fat production and resulted in an average daily gain of 1.105 lbs. per head. On the basis of present prices for feeds, it cost $1.37 to produce 100 lbs. of milk when kale was fed and $1.55 when corn silage was fed. The feed cost per pound of butterfat produced was 31 and 34.5 cts., respectively.

Feeding kale within an hour before milking produced a characteristic and objectionable flavor and odor to both the milk and butter, but when fed shortly after milking there were no objectionable effects.

[Dairying studies in Illinois] (*Illinois Sta. Rpt. 1930, pp. 114, 115, 124–127, 133–135*).—The results of several experiments, some of which have been continued (E. S. R., 62, p. 371), are noted.

P. H. Tracy, H. A. Ruehe, and S. L. Tuckey found no difference in the score of 38 churnings of butter made from cream cooled over a tinned copper-surface cooler and that cooled through an internal tubular cooler.

Studies by Tracy showed that cooling milk to 40° F. and holding it at that temperature for 4 or 5 hours before separating at from 90 to 95° produced a cream that whipped rapidly to a fairly high overrun, and it did not drain out on standing. Aging milk at 60° before separating did not give as good results as holding at lower temperatures.

M. J. Prucha describes the use of the methylene blue test for detecting poorly pasteurized milk or pasteurized milk that had not been cooled properly, poorly sterilized or neglected utensils, and the presence of thermophilic bacteria.

Rats were fed raw and pasteurized milk by J. M. Brannon and Prucha to determine whether pasteurization made the milk less valuable as a source of calcium and phosphorus. The average weight of rats fed raw milk was 184 gm. and of those fed pasteurized milk 185 gm. The percentages of calcium in the bones were 34.25 and 34.36, and of phosphorus 17.84 and 17.45.

Prucha and Brannon held acidophilus milk at different temperatures to determine how soon the bacteria died. Some of the bacteria of such milk were living at the end of 6 days when stored at 100° F., but all died in 9 days. The number of bacteria did not decrease greatly in 15 days at storage temperatures of 70 and 40°. When stored at 0° there was a reduction of about 60 per cent in 15 days.

Preliminary results obtained by Prucha with rats fed milk containing varying amounts of a detergent containing neutral sodium chromate showed no harmful effect of such a washing powder upon the animals.

Prucha, Brannon, Ruehe, and Tracy isolated a specific organism from potato-flavored cream, which, when inoculated into fresh cream and the cream held at from 70 to 75° F. for 24 hours or more, produced the typical potato flavor. The organism apparently produced the flavor by its action on some protein in the cream.

In a study by Tracy, Ruehe, and Tuckey of methods for improving chocolate ice cream, it required approximately 1.5 times as much chocolate liquor as cocoa to impart the same intensity of flavor. A sirup made from 1.5 lbs. of cocoa, 2.5 lbs. of sugar, and 3.5 lbs. of water heated to 175° F. for 15 minutes made a very desirable chocolate flavoring and was sufficient for a 40-lb. mix. The addition of vanilla extract improved the flavor of chocolate ice cream. Hot sirup added to an aged mix did not increase the freezing period appreciably, but did prolong the period when added to an unaged mix. However, better results were obtained if the sirup was added to the mix before

homogenizing or aging. Cocoa fat, the nonfatty constituents of the cocoa, and sugar adversely affected the whipping properties of the mix, which were not improved by the addition of sodium bicarbonate, but adding 0.85 per cent of egg yolk shortened the freezing period and improved the body of the ice cream. Heating the chocolate mix to a high temperature before homogenizing did not shorten the freezing period. Increasing the serum solids and the butterfat content of the mix intensified the chocolate flavor and produced a more pleasing flavor. A sugar content of 17 per cent was recommended to avoid a slightly bitter chocolate flavor.

A successful method for measuring the percentage of fat in ice cream and ice cream mixes, developed by O. R. Overman and O. F. Garrett, is described. Results obtained by this method correspond closely to those obtained with the Official method.

[**Dairy products studies by the Kansas Station**] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 79–84*).—The results of two studies, one of which is in continuation of that previously noted (E. S. R., 61, p. 171), are reported.

Ice cream investigations.—A comparison of ice creams flavored with various forms of chocolate as noted on page 876 showed that the three most desirable samples were flavored with cocoa, cocoa and chocolate liquor, and chocolate liquor when they were added to the respective mixes during pasteurization. Processing studies of chocolate ice cream showed that viscosity was best controlled by raising the homogenizing temperature to from 165 to 175° F., and the most desirable homogenizing pressure appeared to be between 2,000 and 2,500 lbs.

The use of butter in an ice cream mix (E. S. R., 62, p. 465) increased the freezing time per batch 2 minutes and 18 seconds and reduced the overrun an average of 3.1 per cent. The use of soybean lecithin increased the freezing time 4 minutes, while using from 0.3 to 0.5 per cent of dehydrated egg yolk shortened the freezing time 3 minutes per batch. Butter made from neutralized cream increased the freezing time more than butter made from unneutralized cream.

Superheating the ice cream mix or any of its ingredients gave a cooked flavor to the finished ice cream. The use of superheated plain condensed milk as a source of serum solids in a mix made from pasteurized products produced a slightly cooked flavor, while the use of superheated sweetened condensed milk gave a pronounced cooked flavor to ice cream. The cooked flavor was more pronounced when the entire mix was superheated than if one of the ingredients was treated in this manner. The body and texture of ice cream made from superheated mixes were good, but such mixes required from 2 to 5 minutes longer to whip to a 95 to 100 per cent overrun. If the sugar of a mix was superheated a distinct caramelized flavor developed, but if the sugar was added after superheating only the cooked flavor developed. Butter mixes homogenized before and after superheating whipped faster than similar mixes homogenized only after superheating. The body of ice cream made from mixes which were superheated and then homogenized without gelatin was coarse and rough. The greatest benefit derived from superheating ice cream mixes lay in the destruction of bacteria, and such mixes were more viscous than mixes not superheated. On the whole, however, superheating ice cream mixes was detrimental to the production of high quality ice cream.

Strawberries were stored at an average cost of 18.8 cts. per pound. The frozen berries were much superior in flavor after 11 months to the first fresh strawberries on the market. The best proportion for ice cream was 1 lb. of sugar to 8 lbs. of berries.

Tests with corn sugar indicated that it is undesirable for use in sherbets because of its effect on the freezing point. No advantage was found in using more than 6.75 per cent of ice cream mix with a sherbet containing 34 per cent of sugar, but when 28 per cent of sugar was used it was necessary to add 14 per cent of ice cream mix to obtain the same body and texture. Overrun for sherbets should be limited to not more than 30 per cent in order to obtain a satisfactory body and texture.

Butter investigations.—In this study more than 125 lots of cream have been treated in different ways with deodorants and churned with suitable checks. All butters were scored while fresh and after varying intervals. Average scores showed little difference between treated and untreated samples. No germicidal action took place in the cream until the concentration of chlorine reached 180 parts per million, which is more than is added to off-flavored cream. It required more than 400 parts per million of chlorine in cream before it could be tasted in the butter, and when treated with 500 parts per million of chlorine the flavor left the butter within 2 or 3 days. Using more than 500 parts per million produced a tallowy flavor. Treating the cream produced no significant difference in the body or texture of the butter as compared with untreated cream, and there was no significant difference in the time in which off flavors developed in treated and untreated samples held at 40° F. A method has been devised for detecting butter made from treated cream.

[*Studies of hypochlorite disinfectants*].—"A study of the factors affecting the rate of depletion of hypochlorite disinfectants shows that organic matter accompanied by high temperatures results in almost instantaneous and complete loss of chlorine. Butterfat has very little influence on the rate of loss of available chlorine. Increasing concentrations of casein, albumen, or lactose, induce an increased rate of loss of available chlorine.

"The method of manufacturing sodium hypochlorite disinfectant from chlorine gas and sodium hydroxide has been worked out and is now being tried in one Kansas creamery with gratifying success. The results to date indicate that a satisfactory disinfectant solution can be made by dissolving sodium hydroxide and soda ash in water, allowing to cool, and bubbling chlorine gas through the solution. The jar containing the water and salts is weighed on ordinary platform scales and the chlorine is admitted to the solution until the increase in weight indicates that the calculated amount of gas has been dissolved."

"In an effort to devise a simple method of testing the effective strength of chlorine solutions, tablets have been compounded so as to contain sufficient sodium thiosulphate to react quantitatively with the available chlorine in one quart of a rinse solution containing a specified strength of available chlorine. If the chlorine content is in excess of the specified strength, the iodine liberated from potassium iodide in the tablet will cause the starch present to turn purple. If the rinse solution does not contain enough chlorine to react with all the sodium thiosulphate, no purple color will appear. . . . Some of these tablets have been compounded. Titrations indicate that the accuracy of the quantitative amount of sodium thiosulphate in the tablets is well within the limits of accuracy which practical application of the test would demand. In the first attempt to make these tablets, however, it was found that they did not disintegrate readily when placed in water. Experiments are now in progress to solve this practical difficulty."

Using prepared chocolate syrups in making chocolate ice cream, W. J. Caulfield (*Ice Cream Trade Jour.*, *26* (*1930*), *No. 7, pp. 47–49*).—A study was made at the Kansas Experiment Station to compare the composition of nine samples of commercial chocolate ice cream sirups, to note their effect on the

composition and freezing properties of a standard mix to which they were added, and to compare the flavor of such mixes with ice creams deriving their flavor from chocolate and its products.

It was found that all of the commercial sirups had a high concentration of sugar, which was the most serious drawback to their general use. When added to a standard mix, the prepared sirups increased the freezing and whipping time and seriously impaired the standing-up properties of the resulting ice cream. If, however, the composition of the mix was altered to care for the constituents of the prepared sirups, satisfactory results were obtained. These sirups produced extremely variable flavors, which were in no case as desirable as the flavor produced by the use of high-grade cocoa or chocolate liquor.

What goes into the manufacture of a high quality sherbet? W. J. CAULFIELD and W. H. MARTIN (*Ice Cream Trade Jour., 26 (1930), No. 5, pp. 39–42*).—Studies were conducted at the Kansas Experiment Station to determine the most satisfactory percentages of sugar, citric acid, ice cream mix, and stabilizer to use in the preparation of a high quality commercial sherbet. The formula, expressed in percentages, which produced the most satisfactory results is presented. A new method of processing sherbets and a discussion of the freezing process are also given.

VETERINARY MEDICINE

Principal poisonous plants in Kansas, F. C. GATES (*Kansas Sta. Tech. Bul. 25 (1930), pp. 67, figs. 64*).—The first part of this work includes discussions of (1) classes of poisons from a botanical standpoint, (2) from a chemical standpoint, and (3) from a physiological standpoint, general statements regarding the care of animals from a poisonous plant standpoint, treatment of animals that have been poisoned, and procedure in case of poisoning by plants. The principal poisonous plants are then dealt with (pp. 22–64) by families, a description of the plant, effect on animals, and remedial measures so far as known being given for each. A supplementary list of poisonous plants is appended (pp. 64–67).

[Report of work in mammalian pathology at the Illinois Station] (*Illinois Sta. Rpt. 1930, pp. 78–81, 96, 108, 109, 110, 111*).—In work with moldy sweetclover (E. S. R., 62, p. 374), R. Graham and H. S. Grindley were unable to infect wholesome sweetclover hay by placing it in contact with poisonous forage.

It is reported by Graham and F. Thorp, jr., that four additional herds were accredited during the year as free from abortion. The results of testing confirmed the original finding that about 20 per cent of the animals in dairy cattle and beef herds of the State are infected.

Success is reported by Graham and Thorp on a further improving of the botulinum antitoxin. In work with the antitoxin the consistent immunizing or antigenic value of the formolized toxin was extended for at least a period of 6 months through its treatment (after complete detoxification) with ammonium hydroxide.

It is reported by E. Roberts that the feeding of Fowler's solution to animals for show purposes has been found to be a dangerous practice when breeding stock is involved.

Rabies vaccine was found by Graham and Thorp to give inconsistent results in experimental dogs. No consistent difference was observed between the protective value of one, two, or three injections of vaccine, it having protected some dogs and failed to protect others. Comparisons of the protective value of vaccines made with phenol, formalin, and chloroform showed no consistent

differences. Vaccines consisted of 20 per cent tissue emulsion, and 1 gm. was administered to dogs weighing from 10 to 25 lbs. Commercial vaccines gave the same inconsistent results following artificial exposure as were obtained with vaccines prepared at the station. Under certain conditions single-injection rabies virus does immunize dogs, but factors which make it fail under similar conditions are not well defined. It is entirely possible that the intraocular method of exposing vaccinated dogs was too severe. However, irregular results also were obtained following the exposure of vaccinated dogs by intramuscular injection of the virus.

[Work with diseases of cattle, sheep, swine, and horses at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 118–124, 132, 133*).—Of several disease outbreaks investigated during the year particular mention is made of one in baby pigs.

In reporting upon work at the station with abortion disease the kind and number of infected cattle in 53 herds, a total of 2,041 animals, that were tested for abortion are recorded in tabular form. In the course of eradication work with the college herd it was determined that "calves up to 3 weeks of age, born in an infected herd and fed abortion-infected milk, will be blood positive, but when removed from such an environment to clean surroundings and fed abortion-free milk will in all cases become completely negative in periods ranging from 3 to 8 weeks and will continue negative." In a barn thoroughly saturated with abortion infection, a herd of 24 positive cows having been stabled therein for 18 months with numerous abortions during the time, two thorough clean-ups, followed by whitewashing and 3 months of summer sunning during which the premises were kept free from cattle, resulted in a complete eradication of the abortion germ from the premises.

The rapid test or plate agglutination method was adopted as the routine test, it having proved equally as sensitive as the long or tube test on the 1,100 samples tested. In a study of antigens differently prepared it was found that "(1) an antigen suspended in physiological saline solution is quite stable, but is less sensitive than a 12 per cent saline suspended antigen; (2) a 12 per cent saline suspended antigen is more sensitive than (1), but less stable, and if used should be freshly prepared every 30 days; (3) an antigen suspended in buffed solution (NaOH) is quite stable but less sensitive and is slightly inferior to (1); (4) a 12 per cent saline suspended antigen when 3 months to 12 months of age will miss as high as 5 per cent reactors, as determined by a fresh antigen, and will give a high per cent of suspicious or 1–50 reactors which will be clearly positive on the freshly prepared 12 per cent antigen."

The work with blackleg during the two years consisted in the production and distribution of blackleg aggressin, blackleg filtrate, and blackleg bacterin, about 40,000 doses of these products having been distributed each year. As a result of the experiments conducted it is now possible to produce blackleg filtrates and bacterins having a potency of 260 units. A systematic study was made of the action of 68 salts on the growth, fermentation, and gelatinolysis of anaerobic organisms. It was found that *Clostridium chauvei* would not grow in the simple media necessary for such a study, and three easily growing anaerobes, *C. sporogenes*, *C. welchii*, and *C. novyi*, were grown in gelatin and beef broth containing "0.5 per cent peptone and 0.5, 0.05, 0.005, 0.0005, and 0.00005 M concentrations of the 68 salts. From a comparison of the growth obtained it was possible to determine the amount of each salt which should be used." The growth of *C. chauvei* and *C. septicus* was tested on media containing ammonium dihydrogen phosphate and potassium bicarbonate, their growth corresponding closely with that obtained in the same media by the three actively growing organisms. "A comparison of the growth of *C. novyi*,

C. welchii, and *C. sporogenes* in the 68 salts (58 inorganic salts, 9 amino acids, 3 extractives, 2 phosphatids, and 1 nucleoprotein) showed that in most cases there was a definite concentration which produced optimum growth. In many cases there was also a definite toxic concentration."

In the work with shipping fever a study was made of the handling facilities and feeding conditions on farms where losses were high as compared with shelter and food on farms where losses were low, showing clearly that proper shelter and feeding practices will minimize losses. *Pasteurella boviseptica* was isolated from 82.35 per cent of the 17 cases of shipping fever, the lung and heart blood of which were examined. The study indicates that while many organisms may be associated in shipping fever *P. boviseptica* plays the major rôle in the final outcome of the disease. A study of the growth of Pasteurella organisms on a medium containing ferrous sulfate and sodium citrate and the media prepared with some of the mineral salts used for the growth of the blackleg organism led to the trial of 40 different mineral mixtures, and a very efficient agar was finally developed. In this medium *P. boviseptica* remains viable for at least 7 weeks, and it also greatly increases the virulence of cultures. The injection of cultures of *P. boviseptica* and *Escherichia coli* into seven calves under different conditions indicates that the calves can be easily killed by intravenous injections of living pathogenic and normally nonpathogenic organisms, and that the amount of food in the stomach influences the outcome of injections with pathogenic organisms.

Further studies of anaplasmosis are considered to justify the following tentative conclusions: "Iron, manganese, and copper will build up the hemoglobin content of the blood, but do not increase the animal's resistance to anaplasmosis. The blood of 'carrier' or recovered animals retains the ability to transmit the disease as rapidly as blood taken from acute cases of anaplasmosis. Carrier or recovered animals have been resistant to infection. Flies show no effect on animals when the flies are put in darkened inclosures. Calves from infected and well animals do not sicken following their inoculation with blood taken from an acute case of anaplasmosis. Calves inoculated with infective blood seem to acquire a resistance to anaplasmosis. Many infected animals appear to recover completely after a period of 6 months (approximately) except for the continuance of cell inclusions. The inoculation with ground lice taken from an animal sick with anaplasmosis did not reproduce the disease in a susceptible animal. Out of 12 experimental cases of anaplasmosis, there were but 2 deaths, or 16 per cent mortality. These animals never received medication of any sort. This seems to indicate clearly that care, water, feed, and protection from flies and sun are important factors in minimizing losses from the disease."

In control work with stomach worms in sheep the entire station flock was drenched with a 1 per cent solution of copper sulfate each 28 days after April 1, continuing during the grazing season. The flock was grazed on bluegrass, bluestem, orchard grass, rape, rye, Sudan, and sweetclover at different periods during the grazing season. Post-mortem examinations made of the fourth stomach of some 50 sheep slaughtered over a period of 4 years revealed no stomach worm infestation except in 3 cases in which very mild infestations were found.

[Breeding for resistance to hog cholera at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 35–37*).—In the work of breeding swine for natural resistance to hog cholera the foundation material consisted of 1 boar and 9 sows thought to have been natural immunes, they having been bought by a serum company for virus pigs but found refractory. Tested upon arrival at the station none reacted to a second injection of potent hog cholera virus. The results of the

tests for cholera resistance made of 182 pigs during the course of the experiments from 1924 to 1928, inclusive, are reported in tabular form, the arrangement being by sires. Twenty-one (11.5 per cent) of the 182 pigs given the virus tests recovered, although each one of the recovered pigs showed typical symptoms of hog cholera. The results obtained during the 4 years indicate that simple selection is not directly effective in increasing cholera resistance.

[Report of work in avian pathology at the Illinois Station] (*Illinois Sta. Rpt. 1930, pp. 97, 98, 104–108, figs. 2*).—Further evidence (E. S. R., 62, p. 379) that brooder pneumonia is in young chicks the lung form of pullorum disease was secured by R. Graham and F. Thorp, Jr. Comparisons made by these authors during the year of the intradermic or pullorum test and the agglutination or blood test confirmed the observations of previous years that (1) the blood test is more efficient than the pullorin test; (2) the pullorin test properly executed detects an average of from 70 to 75 per cent of the blood reactors; (3) in some flocks pullorin detects a high percentage of infection, although in other flocks the percentage detected may be low; and (4) the potency and selectivity of pullorin are variable.

In continuation of the work on the hereditary resistance of chicks to pullorum disease, E. Roberts and L. E. Card found that there was a 67 per cent survival among over 6,000 chicks from selected or resistant stock and only a 28 per cent survival among control chicks. The results obtained in 1929 show (1) a distinctly higher survival among chicks from matings between selected and unselected stocks than among the chicks from unselected stocks, (2) a higher survival among chicks produced by back crossing first generation resistant stock to resistant stock than among chicks from a back cross to unselected stock, and (3) a higher survival among chicks produced by first generation individuals mated together than among chicks produced from unselected stock.

In work by Graham, Thorp, Jr., and W. A. James an organism was isolated which is associated with at least one type of infectious fowl bronchitis or laryngotracheitis of the fowl, accounts of which by the authors have been noted (E. S. R., 64, pp. 381, 382, 564). During the year natural cases of the subacute, or chronic, type of the disease were observed in flocks where the acute type of the disease had previously occurred or in flocks where only an occasional acute case appeared.

The results with fowl pox obtained in the field by Graham confirmed laboratory observations that healthy flocks can be immunized early in the fall against avian diphtheria, or fowl pox, with a minimum loss.

[Work with diseases and parasites of poultry at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 124–132*).—During the spring of 1928 an acute generalized *Escherichia coli* infection in chicks from 10 to 20 days of age was recognized as a separate disease. A number of outbreaks in chicks 2 weeks of age were encountered in which a sudden onset of symptoms of pulmonary dyspnea accompanied by great depression was followed by death in from 3 to 4 hours. The average mortality was approximately 4 per cent of the affected broods in the 17 outbreaks of colibacillosis encountered in the station flocks and 32 outbreaks in outside flocks.

Mention is made of a disease, typical of navel infection, of day-old chicks from incubators in commercial hatcheries encountered in Kansas and other States which appeared to have been associated with unsanitary methods during incubation. In control work with formaldehyde fumigation it was found that at least three times the quantity of ingredients necessary for destroying *Salmonella pullorum* were required to destroy the spore forms of the anaerobe and a mixture of organisms from superficial tissues. Inoculation experiments

indicated that subcutaneous injection of the culture or contaminated material was necessary to reproduce the infection in susceptible chicks.

In continuation of work with fowl pox begun in 1929 the feather follicle and stick vaccination proved to be preferable to subcutaneous injection of finely ground pox scabs.

In work on the agglutination test for pullorum disease, consisting of a study of the rapid antigens with regard to keeping qualities, salt concentration, and the use of buffer solutions as suspendents, it was concluded that "a 10 per cent instead of a 12 per cent sodium chloride concentration reduces the number of doubtful or delayed clumping tests. Suspensions of *S. pullorum* to be used for rapid test antigen should be held in physiological salt solution and additional sodium chloride added shortly before making tests. Buffered rapid antigens give clearer reactions with far fewer doubtful tests than unbuffered antigens. A buffer with a pH value of 8.2 to 8.6 appears to give the most satisfactory results."

Particular attention was given to the pullorin or wattle test for detecting carriers of pullorum disease, 7,815 tests having been made in experimental and field flocks. The investigations led to the following conclusions: "The very thin skin of the wattle of the fowl precludes the possibility of intradermal injection in many cases with the methods generally employed. The reaction to a single intradermal injection of digest pullorin is manifested by a nonspecific early swelling in infected as well as noninfected fowl, which reaches its maximum size at 3 to 4 hours following injection, and a later specific reaction which attains its maximum size at an average time of 22.5 hours. The character of soft edema, with more or less severe swelling as detected by the touch, is a more satisfactory criterion for interpretation of the reaction to pullorin than is the increase in the thickness of the wattle as measured with the micrometer. Macroscopically and microscopically the pullorin reaction resembles the tuberculin reaction as manifested in birds and other species. No group activity is manifested in local tissue reactions to antigens prepared from *Escherichia coli* and *Salmonella pullorum*. The close relationship of *S. pullorum* and *S. gallinarum* may be demonstrated by tests with intradermal agents prepared from them. Frequent repeated tests with digest pullorins do not cause significant desensitization of reactive individuals. Tests for ophthalmic sensitivity to pullorin confirmed the observations of Ward and Gallagher that a response or reaction is seldom manifested. The ecto and digest pullorins used in these studies were more satisfactory than other types prepared in our laboratory or obtained from other sources. In an effort to develop a satisfactory pullorin, sources of variation in the test, including methods of application and standards of interpretation and comparison, must be given major consideration."

In studies of fowl cholera considerable evidence was obtained that death was due to oxygen starvation of the tissues. "This is indicated (1) by the cyanotic comb, (2) the dark appearance of the arterial blood, (3) the enormous growth of the organism in the blood stream, (4) the fact that these organisms possess a marked affinity for oxygen when grown on artificial media, and (5) the fact that during growth the organism apparently injures the endothelium of the capillaries in the walls of the alveoli of the lungs, thus allowing an escape of plasma which fills the alveoli and prevents the proper oxygenation of the blood."

The bacteriological findings in studies of fowl paralysis were negative, it having been impossible to transmit the disease experimentally in the laboratory. Birds from 53 flocks that were examined showed the lesions typical of range paralysis, the remainder having developed a complete or partial paraly-

sis due to several factors, among which were tapeworm infestation, coccidiosis, inadequate diets, tumors which involved the peripheral nerves or tissues adjacent to it, etc.

The study of the dissemination of pullorum disease in incubators was continued (E. S. R., 61, p. 176). "From the results obtained it was concluded that a humidity shown by a wet bulb reading of 95° F. at hatching time practically eliminated the spread of pullorum disease. The hatchability of the eggs, however, was 9.5 per cent lower than for the hatches under optimum temperature and humidity conditions. It was discovered during the experiment that 'chick down' consists of a scale-like substance that surrounds small bundles of chick fluff on the newly hatched chick, and as the chick dries and brushes against other objects the scale peels off and circulates through the air. It is thought to be this scale, together with dust particles, that carries the pullorum disease from diseased to healthy chicks. A high humidity at time of hatch greatly reduces both the number of scales that peel off of the chicks and the number that float through the air."

In work on the relation of adequacy of diet to disease a study of the increase of the uric acid in the blood of hens in the last stages of avitaminosis A was continued, the percentage of urinary nitrogen being reported in tabular form.

The study of parasites during the biennium included the development of a new technic for isolating intestinal worms and of a safe, effective anthelmintic against the large roundworm in growing chickens. The results of a series of experiments with carbon tetrachloride as an anthelmintic for the intestinal worm *Ascaridia lineata* (Schneid.) showed that growing chickens could be safely and effectively treated for the worms with a dosage rate of 4 cc. per kilogram of body weight. Crickets, cockroaches, spiders, sow bugs, and earthworms collected in poultry yards where the chickens were heavily infested with tapeworms were fed to chicks reared in confinement with negative results. However, six chickens fed earthworms, *Helodrilus caliginosus trapezoides*, on October 12, 1928, became infested with sexually mature cecal worms, *Heterakis papillosa* (Bloch). It was found by placing eggs of *A. lineata* in soil and in chicken yards and houses that high temperatures and low humidity are the most potent factors against the survival of the eggs in nature. Low temperatures were also found to be unfavorable, those from −10 to −20° F. being lethal in most cases. Eggs on the surface of the soil do not survive the entire winter, but those deposited in late February survive and develop slowly, reaching the infective stage in late April or early May in time to be eaten by the second brood of baby chicks.

Studies of the effect of thymectomy on growing chickens and upon fowl parasitism failed to show any constant differences in a number of criteria.

In studies made of the control of the feather mite in chickens it was found that nicotine sulfate can be safely used to eradicate the pest through its application to the roost without the necessity of handling individual birds.

[Breeding for resistance to fowl typhoid at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 65, 66*).—The results of breeding for resistance to fowl typhoid in poultry are presented in tabular form. The mortality in chicks from all the nonselected groups was much higher than among the chicks with both selected parents, being 89 per cent for the former and 38.5 per cent for the latter. The chicks having one selected parent (typhoid surviving) also showed much greater resistance to an infection of fowl typhoid than did those from the unselected population, demonstrating clearly that resistance may be transmitted either through the male or through the female. In 1928 nine different sires were used in the selected group, each one having been mated

with several selected females, the differences in the ability of sires to transmit resistance having varied from 7 to 48 per cent. During 1929 the emphasis was placed upon fixing the resistance of the best sires and dams, a tabulation of the results secured early in the season indicating that the mortality in the selected or typhoid resistant population will be considerably less than in either 1927 or 1928.

Fowl-pox control, W. T. JOHNSON (*Oregon Sta. Bul. 273 (1930), pp. 24, figs. 7*).—This account deals first with the nature of the lesions, immunity, vaccination methods, the vaccination technic used in Oregon, and field vaccinations in 1926–1930. This is followed by a further report (E. S. R., 58, p. 179; 62, p. 774) of experimental work (pp. 12–23), the details of which, including individual gains in weight of chicks vaccinated with fowl pox virus, daily individual egg production of 20 susceptible fowls vaccinated four sticks per fowl with fowl pox virus, egg production of commercial flocks vaccinated with fowl pox virus, and egg production of vaccinated fowls, including fowls vaccinated with pigeon pox virus and with fowl pox virus, are presented in tabular form.

It was found that a high percentage of takes resulted from the three methods, namely, scarification, follicle, and stick, but the last (E. S. R., 62, p. 473), with one stick per fowl, is recommended.

"Thirty-day-old S. C. White Leghorn chicks vaccinated by the needle stick method showed slightly less gain in weight than unvaccinated controls, the difference being greatest during the third and fourth weeks after vaccination rather than the first and second weeks. Vaccination of chickens in production with fowl pox virus was followed by variations in egg production ranging from slight retardation to drastic drop. Chickens previously immunized to fowl pox virus inoculated cutaneously showed a local mild pox reaction more quickly than highly susceptible ones. Vaccination of turkeys with fowl pox virus was highly successful. Distinct resistance was demonstrated in chickens vaccinated 967 days previously. Chickens in one flock vaccinated with fowl pox virus dropped drastically in production the third and fourth weeks after vaccination, while others in the same flock vaccinated with pigeon pox virus dropped but slightly during the same period. Chickens vaccinated with pigeon pox virus, one stick per fowl, developed a take for each stick. Approximately 270,000 chickens have been vaccinated for fowl pox with unattenuated fowl pox virus in the State of Oregon from 1926 to 1930, inclusive—105,000 by the author and 165,000 by others authorized by the State Livestock Sanitary Board."

A list is given of 31 references to the literature.

[Chicken pox—the use of anthelmintics for intestinal parasites], F. B. L. GUERRERO (*Guam Sta. Rpt. 1929, pp. 5, 6*).—Fowl pox again appeared during the year in the station flock, but only small chicks were attacked, the older stock apparently being resistant. The use of benetol and creolin, particularly the former, gave good results in its treatment.

The administration of carbon tetrachloride in oil (1 to 3 parts of fresh coconut oil) again proved to be satisfactory in combating ascarids and was of considerable benefit against tapeworms (E. S. R., 63, p. 176). Kamala was more satisfactorily used against stomach worms but gave poor results for ascarids; papaya seed had very little effect on tapeworms and ascarids and no effect on other parasites. Epsom salts at the rate of 1 oz. to 1 gal. of water, when kept before the chickens for 25 hours or longer, was beneficial in expelling esophageal worms. A dosage of pure coconut oil was not effective against any of the parasites.

Germicidal efficiency of sodium hydroxide, sodium carbonate, and trisodium phosphate, F. W. TILLEY and J. M. SCHAFFER (*Jour. Agr. Research*

[*U. S.*], *42* (*1931*), *No. 2*, *pp. 93–106*).—The authors here record the results which they have obtained, for the most part, in making a comparative study of disinfectants that might be used by poultrymen. The details of this work are presented in large part in tabular form.

The bacteriological tests were made with "sodium hydroxide, sodium carbonate, trisodium phosphate, mixtures containing sodium carbonate or trisodium phosphate with sodium hydroxide or with soaps, and mixtures containing sodium hydroxide and calcium hydroxide. The test organisms used were *Eberthella typhi*, *Staphylococcus aureus*, *Salmonella pullorum*, *S. gallinarum*, *Pasteurella avicida*, two strains of hemolytic streptococci, and spores of *Bacillus anthracis*.

"Sodium hydroxide, alone or in mixtures with sodium carbonate, trisodium phosphate, or calcium hydroxide, was found to have relatively high germicidal efficiency against all these organisms, even in the presence of organic matter in the form of skim milk, chicken feces, or defibrinated horse blood. During the course of the work it was found that solutions containing 2 per cent sodium hydroxide and 10 per cent calcium hydroxide failed to kill *Mycobacterium tuberculosis* without organic matter after two hours' exposure. Sodium carbonate, trisodium phosphate, and calcium hydroxide each had comparatively little germicidal efficiency at ordinary temperatures, but when added to solutions of sodium hydroxide they increased the germicidal efficiency of these solutions. The germicidal efficiency of solutions of sodium carbonate or trisodium phosphate or of mixtures containing either of these compounds with sodium hydroxide was greatly increased by heat. The addition of sodium carbonate or trisodium phosphate to soap solutions increased their germicidal efficiency."

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Illinois Station] (*Illinois Sta. Rpt. 1930*, *pp. 96*, *97*, *199–221*, *figs. 5*).—Progress results of studies in agricultural engineering are briefly reported (E. S. R., 62, p. 381).

Studies by C. W. Crawford and E. T. Robbins of the pulling power of 109 teams of horses and mules, as indicated by a dynamometer, showed that the big teams pulled the heaviest loads. Pulling power seems to be closely associated with large size, great heart girth, energetic but calm disposition, and good driving. Horses in good flesh and with sharp shoes also have an advantage. The results indicate that horses have immense reserve power for emergencies, such as moving loads through soft ground or up hillsides.

Data also are reported by E. W. Lehmann, A. L. Young, R. I. Shawl, and D. A. Albrecht, on farm uses of electricity, septic tank operation, crank case oil tests, the life of the farm tractor, draft of farm implements, and soil erosion control.

In the corn borer control studies, Young and Shawl, with R. B. Gray of the U. S. D. A. Bureau of Public Roads, found that, although very good covering of debris is possible with 14-in. plows when properly equipped, especially if liberal clearance is provided beneath the beams for the passage of trash, particular care on the part of the operator is necessary if good results are to be secured. Bottoms specially shaped so that they pitch the dirt farther and leave the open furrow wider at the bottom will evidently give considerably better coverage, but probably would not be so well suited to the plowing of all types of ground as the general-purpose bottoms now commonly used.

Experiments by Young, Shawl, and Lehmann on the mechanical harvesting of corn and small grains showed that for all crops the threshing loss was higher for combines than for stationary threshers. Of the total loss, that left

by the cutter bar was largest. The shock loss was highest in the threshing of wheat, indicating that particular care should be used in cleaning up around the shocks. Tests on samples collected in oats fields indicated that the interval between time for binding and time for combining is considerably less than that for wheat, probably not more than 5 or 6 days.

Nine tests of corn harvesting losses were made in machine-picked fields and 7 in hand-picked fields. In the machine-picked fields the total loss varied from 24.8 to 2 per cent, with an average of 10.2 per cent. The ear loss varied from 14.7 to 1.1 per cent, with an average of 6.6 per cent, or 65 per cent of the total loss. The shelled corn loss varied from 10.1 to 0.9 per cent, with an average of 3.6 per cent, or 35 per cent of the total loss. The ear loss increased as the stalks and shanks became drier, and the shelled corn loss increased as the ears dried out. In the hand-picked fields the amount left in the field varied from 7.3 to 3.6 per cent, with an average of 5 per cent.

New tests by Lehmann and Young on equipment for artificially drying grain and by Lehmann, H. W. Anderson, and R. L. McMunn, on stationary spray plants are also described.

[Agricultural engineering investigations at the Iowa Station] (*Iowa Sta. Rpt. 1929, pp. 11, 12*).—Studies on the practicability of waterproofing a masonry arch roof indicated the feasibility and utility of pointing up all open joints with rich mortar, painting each concrete rib with neat cement wash, and painting the entire roof with two coats of raw linseed oil.

A study of nearly 100 cows showed a rather definite relationship between the weight of the cow and the length of stall platform necessary. By dividing the weight of the cow by 50 and adding 36.5 in. to the quotient, one can very closely approximate the proper stall length from the center of the manger curb to the gutter.

Data also are briefly reported on the cost of corn production.

[Agricultural engineering investigations at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 50, 51, 142*).—It is reported that the wheat combine is very well adapted for the harvesting and threshing of suitable varieties of sorghum. The necessary adjustments are easily made and require very little expenditure of money and labor. Many of the 18 varieties of sorghums tried out proved to be poorly adapted for combining. The most important characteristic of sorghums in combining is their ability to stand up in all kinds of weather and until late in the winter. From the threshing standpoint the necessity of taking considerable stalk and leaves in order to get all of the heads does not seem to be objectionable. Two men with the harvesting unit and one with a truck harvested as much as 200 bu. per hour at a cost of about 62 cts. per acre.

The safe storage of combined sorghums presents a more difficult problem than harvesting and threshing. Sorghums containing 16 per cent of moisture were safely stored in a well-ventilated steel bin from December to April. Sorghums having an average moisture content of 19.4 per cent were badly molded and damaged in the bottom of a tight wooden bin after being stored until February 18. Moving the grain did not materially improve the condition.

Studies of combined wheat storage are noted on page 886.

In feed-grinding studies the most important single factor affecting the energy requirements of silage cutters was the speed at which the elevator fan was operated. If the speed was excessive, energy was wasted in overcoming air friction. Increasing the speed increased the capacity, but the power requirement was increased more rapidly. From 400 to 550 r. p. m., if maintained, was sufficient to operate any of the cutters while elevating into a 40-ft. silo. The energy for cutting kafir silage into 0.25-in. lengths in-

creased approximately 1 per cent for every ton load that passed through the cutter, due to gradual dulling of the knives. The power consumption was from 35 to 60 per cent greater for dull knives than for sharp ones, depending upon the material cut. The capacities of the cutters varied from 5 to 15 tons per hour when using a 10-h. p. motor, depending upon the condition of the material and the length of cut. The capacity for a 0.5-in. cut was approximately 35 per cent greater than for a 0.25-in. cut.

A practical Venturi meter for irrigation service, J. E. CHRISTIANSEN and I. H. TEILMAN (*Engin. News-Rec., 106 (1931), No. 5, pp. 187, 188, figs. 3*).—In a contribution partly from the California Experiment Station, a description is given of an installation of Venturi meters in the Consolidated Irrigation District near Fresno, Calif. The meters are built of precast concrete tubes and range in size from 16 to 42 in. They consist of three sections to form the tube and a vertical well for measuring heads. Beginning at the upstream end, the parts of the meter consist of (1) a short entrance section of uniform diameter containing the entrance pressure connections, (2) the combined entrance cone and throat sections with the throat piezometer ring, and (3) the exit cone of gradual taper providing a return to the original diameter. The discharge end of the meter consists of a concrete head gate which is constructed as part of the device. The piezometer rings, both at entrance and throat, consist of ½- or ¾-in. iron pipes embedded in the wall of the section with four or five equally spaced ⅝-in. holes drilled through the concrete to the inside of the tube.

The results of discharge coefficient determinations are also presented.

A review of power take-off standardization work, W. L. ZINK (*Agr. Engin., 12 (1931), No. 1, pp. 24–26, figs. 3*).—The activities of the Power Take-Off Committee of the American Society of Agricultural Engineers are briefly reviewed, and recommendations are presented for standard practice in the design and manufacture of power take-offs.

Dynamometer car for tractor trials (*Engineering [London], 131 (1931), No. 3390, pp. 13, 14, figs. 3*).—The dynamometer car used in the recent international agricultural tractor trials in England is briefly described and illustrated.

Studies on the qualities of combined wheats as affected by type of bin, moisture, and temperature conditions, I, F. C. FENTON and C. O. SWANSON (*Cereal Chem., 7 (1930), No. 5, pp. 428–448; abs. in Kansas Sta. Bien. Rpt. 1929–30, pp. 51, 52*).—The progress results of studies conducted by the Kansas Experiment Station in cooperation with the U. S. D. A. Bureaus of Agricultural Economics and Plant Industry are reported.

The 11 bins, each of approximately 500 bu. capacity, and previously referred to (E. S. R., 64, p. 82) were used. They included (1) concrete stave similar to silo construction, placed on a concrete foundation and floor, with the outside surface waterproofed, (2) the same as bin 1 except that both the outside and inside surfaces of the wall were waterproofed, (3) square, constructed of concrete boards, making a wall 5 in. thick filled with horizontal air spaces, with the foundation and floor made of concrete, (4) wooden bin with lumber both inside and outside of the 2- by 6-in. studs, the inside walls and roof being lined with 0.5-in. Celotex boards, (5) wooden bin similar in construction to bin 4 but with the Celotex omitted, (6 and 7) circular steel bins, set on wooden floors, with ventilated side walls, and each having a large central flue with suction cupola on top, (8 and 9) circular steel bins with tight side walls, metal floors and roofs, (10) circular steel bin with tight side walls, steel floor and roof, and small central ventilator of steel, and (11) circular steel bin with slight ventilation in the side walls and steel floor and roof.

It was assumed that a temperature of 45° C. (113° F.) was dangerous, and whenever the wheat reached this temperature it was moved and thus cooled. The blower elevator was the more effective in cooling, but the amount of cooling also depended on the outdoor temperature. Wheat moved on hot days was cooled very little, while on cool days a very decided cooling was effected.

The grain in bin 1 kept in perfect condition, and that in bin 2 overheated quickly and was moved. According to the baking test, all samples from this bin had suffered damage, some more than others, but those taken at the second moving had suffered the least. On the whole, it can not be said that wheat in bin 3 had suffered any damage which would seriously lower its milling and baking values, although the low germination and fairly high rancidity in some of the samples showed that this wheat had, in part, suffered some deterioration. All the samples from bins 4 and 5 graded "no damage," and, except for one sample, the rancidity tests were low. The baking results also did not indicate any damage.

The wheat in bin 6 kept very well on the whole and that in bin 7 even better. In germination, rancidity, and baking tests, the wheat from bin 9 was quite similar to that from bin 2. The wheat was practically all dead, the rancidity, except in one sample, very high, and the baking tests, except in a few cases, showed poor results. The wheat in bin 11 was dead in most of the samples, and the rancidity was high except in three samples. In these two respects the wheat was quite similar to that in bins 2 and 9, but the baking results indicated somewhat less damage, showing that the wheat in bin 11 had not suffered so much damage on the whole as that in bins 2 and 9.

Ventilating flues placed vertically in the wheat were apparently of no value. They seemed to be more harmful than beneficial, since there was usually an area of excessively damp wheat around these ventilators. The same was true of the small central ventilators furnished with some of the steel bins.

Moving wheat to prevent serious or total damage seemed to be quite effective. Based upon the movement of 16 bins of wheat, it appeared that the wheat can be cooled two-thirds of the difference between the wheat temperature and the outside air temperature.

Barn ventilation with electric fans, A. W. Clyde (*Agr. Engin., 12 (1931), No. 1, pp. 9–14, figs. 7*).—Studies conducted at the Iowa Experiment Station showed that fans with automatic control by temperature are a promising development in barn ventilation. When placed in the side of the barn away from prevailing winds and used with antibackdrafting inlets, the wind had little effect on them. Less attention was required than would be needed with a gravity system under different weather conditions. In a 64-cow barn, running an average of 16½ hours per day, the power used was ⅛ kw. hour for each hour of running, or 2⅝ kw. hours per cow per month. This power can be reduced by changes in fan blades and motors. While the temperature regulation was usually satisfactory, it was evident that thermostats reversing on 2 or 3° would give closer regulation under changing conditions than the 7 or 8° thermostats used.

The study showed the utter impossibility, with present methods at least, of putting dairy cows in a poorly insulated barn in the Iowa climate and expecting them to keep it above freezing if the air is changed very often. Something better than a single boarded wall or an ordinary 8-in. masonry wall is necessary in barns of ordinary size.

New Jersey brooder house or small laying house, J. C. Taylor and E. R. Gross (*New Jersey Stas. Hints to Poultrymen, 19 (1931), No. 5, pp. 4, figs. 5*).—Practical information is given on the construction of this house, together with working drawings and a bill of materials.

A practical brush-out test for hiding power of paints, H. A. Gardner, G. G. Sward, and S. A. Levy (*Amer. Soc. Testing Materials Proc., 30 (1930), pt. 2, pp. 891–894, fig. 1*).—This paper deals with a practical method of determining hiding power by actually brushing out a paint upon a surface of checkerboard linoleum made up of black and white blocks. The results obtained by this method were compared with results obtained by the Pfund cryptometer, and it was found that the brush-out method gives higher results. The results, however, retain the same order of magnitude.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Illinois Station, 1929–30] (*Illinois Sta. Rpt. 1930, pp. 8, 9, 92–95, 151–177, 178–181, 182–198, figs. 11*).—Results of investigations not previously noted are reported on as follows:

[*Rural group activities*, D. E. Lindstrom and H. W. Mumford] (pp. 8, 9).—A detailed analysis of the inventories of rural group activities of 68 communities in 6 counties of Illinois showed 227 economics, 361 educational, 313 religious, and 242 social groups, or an average of 17 groups to each community.

[*Membership relations in cooperative livestock shipping associations*, R. C. Ashby] (pp. 92, 93).—Responses from members of associations showed that 36 per cent of the owners and 39 per cent of the tenants had given no thought to the responsibility of members to an association, 51 and 65 per cent, respectively, had not previously belonged to a cooperative association of any sort, and 69 and 81 per cent, respectively, reported larger returns as the advantage of a shipping association.

[*Truck and rail hog shipment shrinkages, R. C. Ashby*] (pp. 93–95).—Data from farms having good scales regarding 1,100 hogs shipped by rail and 779 shipped by truck showed the shrinkage between farm and market to have averaged 0.9 per cent for the rail shipments and 1.1 per cent for the truck shipments. Of 69 farm scales tested, only 6 weighed correctly within a tolerance of 2 lbs. per 1,000 lbs. of load.

[*Farm organization and management*, H. C. M. Case, M. L. Mosher, J. B. Andrews, W. A. Herrington, and F. A. Fisher] (pp. 151–153).—A table is included for the years 1925–1929 summarizing income, investment, and efficiency factors for farms in Livingston, McLean, Tazewell, and Woodford Counties in the cooperative farm bureau-farm management service project (E. S. R., 62, p. 385). Comparison of the averages for the 76 most profitable farms with those for the 76 least profitable farms in 1929 showed that the most profitable farms produced 10.7 bu. of corn, 9.2 bu. of oats, 4 bu. of winter wheat, 3.7 bu. of spring wheat, 13.5 bu. of barley, and 5.6 bu. of soybeans more per acre; that they realized $40 more from each $100 worth of feed fed to productive livestock and fed $1.23 worth of feed more per acre; and that the cost of horse and tractor power and machinery was 85 cts. per acre less, that of labor, including operator and family, 49 cts. per acre less, and expenses other than labor, power, and machinery 47 cts. per acre less than on the 76 least profitable farms. The difference in crop yields, efficiency of livestock, costs of labor, power, and machinery, amount of livestock, and miscellaneous expenses averaged $2,597 in favor of the most profitable farms.

[*Farm earnings*, R. R. Hudelson, P. E. Johnston, and H. C. M. Case] (pp. 153–166).—A table is included summarizing, by areas, the financial organization and returns as shown by business records for 1929 from 1,434 farms in 77 counties of the State.

[*Cost of production*, R. H. Wilcox, H. C. M. Case, and R. G. Trummel] (pp. 166–168).—A table is included showing, by items, the average costs and incomes on 14 Clinton County farms, by years 1926–1928, for a work horse, a milch cow, 100 lbs. of pork, and 100 hens.

On 114 farms in the area studied livestock receipts constituted more than two-thirds of the total farm income, and dairying made up 60 per cent of the livestock receipts. On the 14 Clinton County farms dairy cattle returned $164, poultry $171, and hogs $147 for each $100 worth of feed fed. The costs of labor per $100 worth of feed fed were from $30 to $35 for dairy cattle and poultry and $15 for hogs.

[*Cost of producing soybeans*, R. C. Ross] (pp. 168–171).—The costs per bushel of growing soybeans were $1.05 in 1928 and $1.07 in 1929. A table is given showing the growing, harvesting, and overhead costs, yields, prices, and profits per acre, 1928 and 1929, of growing and harvesting with and without a combined harvester-thresher.

[*Cost of producing milk*, H. C. M. Case, G. B. Byers, and C. S. Rhode] (pp. 173–176).—Data were obtained for 1927 and 1928 from 104 farms in the Chicago whole milk area and 85 farms some distance from Chicago. In the Chicago group the average cost per cow was $170.61 and the production of milk per cow 8,147 lbs. and of butterfat 288 lbs. For the other herds the average cost per cow was $144.80 and the production of milk 7,563 lbs. and of butter fat 284 lbs. In 1928, 54 of the 189 herds showed an average earning of 6.52 per cent on the investment, as compared with an average of 1.56 per cent for 100 typical dairy farms in the area.

[*Cost of growing young orchards*, H. C. M. Case, R. I. Nowell, and V. W. Kelley] (pp. 176, 177).—A table is given showing, by items, the acre costs and returns for each of the first 5 years on young peach orchards. The total average variable cost per acre was $94.79, overhead costs $39.48, and harvesting costs $8.59. The average income for the 5-year period was $87.62.

[*Financial operation of elevators*, C. L. Stewart, L. J. Norton, and L. F. Rickey] (pp. 178–181).—Data from 169 elevators for the business years ended between July 31, 1928, and June 30, 1929, in the study noted (E. S. R., 62, p. 386) showed the average net worth of stock to be 137 per cent of the par value and the average net earnings to be 15.89 per cent of the par value. Of the companies, 103 showed earnings of from 8 to over 20 per cent and 21 showed losses. The gross margin earned on wheat in 1928 was only a little more than 2 cts. per bushel.

[*Utilization of Chicago grain storage space*, L. J. Norton] (pp. 182, 183).—In 1929 from 44 per cent in June to 75 per cent in October and November (average for the year 60 per cent) of the storage space in Chicago grain elevators was utilized, as compared with an average of from 35 per cent in August to 58 per cent in March and April (yearly average 49 per cent) for the period 1924–1928. In 1929 the utilization in public elevators averaged 82 per cent and that in private elevators 48 per cent.

[*Price studies*, L. J. Norton] (pp. 186–189).—A study of the Federal pig surveys, 1923–24 to 1929–30, and hog prices showed (1) that intentions to breed, if properly interpreted, indicated fairly well the changes reported in farrowings. Intentions in Illinois, 1923–1929, averaged 11 per cent above the farrowings. Correcting intentions for the individual years by subtracting 11 per cent left

an average error of only 4.5 per cent. (2) Changes in number of pigs farrowed tend to understate the subsequent changes in numbers of hogs marketed, the average error for 5 of the 7 years in Illinois being about 5 per cent. (3) Receipts from October to March, inclusive, tend to alternate larger and smaller by 2-year periods than the changes in pig crop of the previous spring would indicate. (4) Variations in market receipts from April to September, inclusive, do not follow the same tendency to alternate in a 2-year sequence, but there is a tendency for relatively high winter receipts compared to spring crop to be followed by low summer receipts and vice versa.

Since 1921 the larger the yearly volume of hogs marketed the lower the total returns have been, but the relationship does not hold for monthly receipts and prices.

[*Farm land tenure and transfer*, C. L. Stewart] (pp. 189–194).—Maps are included showing, by counties for 1924, the percentage of harvested crop acreages held in different types of tenure. A table is given showing for 1913–1927, 1913–1915, and 1925–1927 the number and percentage of transfers of farm land in Champaign County, by size of units. Of the 1,701 transfers, over 25 per cent were made in 1917 and 1919. The average size of transferred tracts varied from 71 acres in 1925 to 114 acres in 1927, the average for the 15-year period being 84 acres. Nearly one-third of the transfers were within families.

[*Illinois hog markets*, L. J. Norton and R. C. Ashby] (pp. 194, 195).—A study of average closing prices for 1926–1929 at Chicago and St. Louis and for 1928–29 at Indianapolis and Cincinnati showed that (1) based on light- and medium-weight hogs, Cincinnati prices were highest followed by Indianapolis, St. Louis, and Chicago; (2) margins varied considerably from day to day; (3) during certain periods the rank of markets varied; (4) East St. Louis prices tended to rule below Chicago prices in the late summer or fall, and in 1929 the margins were less in favor of St. Louis than in the previous year; (5) Indianapolis prices were quite consistently higher than those of either Chicago or East St. Louis; and (6) Cincinnati prices were higher than those at East St. Louis and also than those at Indianapolis for medium- and light-weight hogs.

[*Milk surplus control*, R. W. Bartlett and C. A. Brown] (pp. 195–198).—Charts are given showing the milk production and fluid sales, 1927–1929, and the production and sales, farmers' basic volume, and distributors' surplus, 1929, in the Peoria marketing area.

[**Investigations in agricultural economics at the Kansas Station, 1928–1930**] (*Kansas Sta. Bien. Rpt. 1929–30, pp. 16–21, figs. 2*).—Continuing earlier work (E. S. R., 61, p. 179), investigations not previously noted are reported on as follows:

[*Marketing Kansas wheat*].—As compared with former years the Kansas City cash wheat market was found to be decidedly weaker in January because of increased early movement of Canadian wheat before the Lakes close, an increasing westward movement of Canadian wheat, and a quicker movement of Argentine and Australian wheat; is weaker in May because of increased carry-overs of old wheat that have a particularly bearish effect in the closing out of the open interest in May futures; and is considerably stronger in June because of the growing importance of combine-territory wheat in the Southwest and frequent reasons in this territory for crop scares right up to harvest time in June.

A graph is included showing the number of times from 1892–93 to 1928–29, inclusive, that the monthly high price of No. 2 hard winter wheat at Kansas City was higher or lower than in the preceding month.

[*Economics of the poultry industry*].—A graph is given showing the average number of chickens of different classes on 400 Kansas farms from March, 1928, to February, 1929, inclusive. The total annual value per 100 hens of all poultry consumed by the farm family averaged $24.58 and of all eggs $22.14, being 24 and 10 per cent, respectively, of the total value of all poultry and eggs produced.

[*Marketing Kansas livestock*].—A tendency was noted for the smaller markets and the within-State markets to get a larger proportion of hogs and for marketing by truck to even out the monthly peaks and to scatter out the home-raised and home-fattened livestock more evenly over the year. Bluestem hill cattlemen hold their cattle later in the fall when the grazing is good. Cattle and hog markets weaken one or two weeks previous to note-paying dates. The corn crop in the major corn-producing States determines the price changes for grass-fat cattle from August to September, and affects cattle and hog prices for two or three years from May or June of the year planted. Previous profits and losses appear to be the major force in determining the demand for replacement of sheep and cattle, profits and losses not being determined by the selling price any more than by the purchase price.

[Investigations in agricultural economics at the Ohio Station], J. I. FALCONER (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 77, 78*).—A table is included showing the average prices, 1910–1914, 1925–1929, and 1930, and the indexes (1910–1914=100) of the prices, 1921–1924, 1925–1929, 1930, and December, 1930, of the leading agricultural products of the State.

The index numbers of production, prices, and income previously noted (E. S. R., 64, p. 784) are brought down through December, 1930.

Types of farming in Kansas, J. A. HODGES, F. F. ELLIOTT, and W. E. GRIMES (*Kansas Sta. Bul. 251 (1930), pp. 112, figs. 42*).—This bulletin reports a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, for which the chief sources of data were reports of the Kansas State Board of Agriculture, county assessors, the U. S. Department of Agriculture and the Bureau of the Census, and the station. Maps are included showing, by counties, the percentage of land area in farms and crops and of farm area in crops, the acreage of different crops, number of livestock of different kinds and of poultry, and the amount of milk and butterfat production. The 12 type-of-farming areas and the factors considered in determining them, the factors causing variations in farming systems in the several areas, and the typical systems in each area are discussed.

An economic study of range sheep production in Arizona, K. P. PICKRELL and E. B. STANLEY (*Arizona Sta. Bul. 134 (1930), pp. 519–551, figs. 2*).—Confidential records of their business were obtained from 20 Arizona ranchers engaged exclusively in the sheep business for the years 1927, 1928, and 1929. Tables are given showing, by items, for each year, and the averages, for the three years, the capital investment, expenses (cash and noncash), receipts, income, and other data as to sales of lambs and wool, prices, death losses, etc., for all outfits, for outfits lambing early, for outfits lambing in February, for outfits lambing a portion of sheep early and the remainder in February, and for outfits lambing in May.

The data for the several items are discussed, and a table is included showing the investment per head, lamb crop, value per lamb, fleece weight, wool price, maximum loss and slaughter percentage, maintenance and operation cost, and cash receipts per head in order that early, February, and May lambing outfits may pay 8 per cent on capital investment and a customary managerial salary.

This study was made in cooperation with the U. S. Department of Agriculture and the New Mexico Experiment Station.

Marketing fluid milk in four Virginia cities, J. L. MAXTON and C. C TAYLOR (*Virginia Sta. Bul. 275 (1930), pp. 42, figs. 5*).—The data, which are for 1929, were obtained in 1930 by personal visits to milk distributing agencies in Newport News, Petersburg, Lynchburg, and Bristol, cities of 20,000 to 40,000 population. Usable records were obtained from 30 producer-distributors and 4 dealer-distributors. The fluid milk supply, market channels, demand for and quality of market milk, city milk ordinances, services rendered by distributors, costs of distribution, prices received, and causes of producer-distribution and the conditions justifying such distribution are discussed and two plans outlined for the economical distribution of fluid milk.

The consumption of fluid milk per capita in the 4 cities averaged 0.5 pint per day, that sold by dealer-distributors averaged 4 per cent butterfat, and that sold by producer-distributors 4.2 per cent. The average bacteria count was 24,000 per cubic centimeter in the summer and 15,000 in the winter for the 8 dealer-distributors, being lower than for the producer-distributors, as nearly all of the former sold pasteurized milk. Costs of distribution varied from 8.7 to 30.1 cts. per gallon, the average for the 30 producer-distributors being 15.7 cts. and that for the 4 dealer-distributors from whom usable records were obtained being 19.6 cts. Prices to retail consumers ranged from 10.7 to 20 cts. per quart. The 4 dealer-distributors paid an average of 33.9 cts. per gallon for both the basic and surplus milk and received an average of 66 cts. per gallon for all sales of milk or cream.

It was found that producers are justified in distributing milk if dealer-distributors will not pay within 25 cts. per gallon of the average resale price of all fluid milk, provided the producers have adequate labor and equipment to give good service and high quality milk at moderate cost without impairing the efficiency of their regular farm work.

Crops and markets [February, 1931] (*U. S. Dept. Agr., Crops and Markets, 8 (1931), No. 2, pp. 33–80, figs. 3*).—Tables, graphs, reports, summaries, and notes of the usual types: statistics, by States, for 1929, 1930, and 1931 showing the numbers, farm value per head, and total of different kinds of livestock on farms, January 1; tables showing the average monthly prices of livestock and poultry and their products, 1910–1930; and summaries of the 1931 agricultural outlook and intentions to plant potatoes in 1931, and the prospective utilization of the 1930 potato crop are included.

Farm population associated with size of farms, with value of farm land and buildings, with mortgaged owner-operated farms, with location of farms on kinds of roads, C. J. GALPIN (*U. S. Dept. Agr., Bur. Agr. Econ., 1930, pp. [2]+10, pls. 12*).—Maps based on the 1925 census of agriculture are included showing by States the farm population for 1925, and by counties for 1925 the average size of farms, average value per acre of farm land and buildings, the average value per farm of farm land and buildings and of all farm property, the value of farm land and buildings and of all farm property per capita of farm population, mortgaged owner-operated farms, and farms located on unimproved and improved roads. The text discusses the distribution of farm population in relation to the several conditions portrayed on the maps.

FOODS—HUMAN NUTRITION

Standardizing methods of roasting beef in experimental cookery, E. LATZKE (*North Dakota Sta. Bul. 242 (1930), pp. 18, figs. 7*).—The studies reported, which form a part of the national project on factors which influence the quality and palatability of meat, deal chiefly with temperature changes taking place in standing beef roasts during roasting at different oven tem-

peratures and after removal from the oven, the effect of these changes upon the doneness and quality of the roast, and the establishment of time tables for cooking roasts to varying degrees of doneness.

Standing 9–10–11 rib roasts of a good grade of beef obtained from a local market were used for the experimental roasting, which was done in open pans in gas ovens with standard heat regulators. The roasts were seared in an oven maintained at a temperature of 250° C. for 20 minutes and for the subsequent roasting various temperatures from 110° to 175° were used. The roasts were removed from the oven when the desired internal temperature, as determined by meat thermometers, had been reached, and allowed to stand until the maximum temperature was reached, when the meat and drippings were weighed to determine cooking losses.

Preliminary studies to determine the internal temperatures of ideal rare, medium, and well-done roasts led to the conclusion that roasts seared for 20 minutes at 275°, cooked at 125°, and removed when the internal temperature was 51° were ideal for rare roasts, with the corresponding internal temperatures of 61° for medium and 71° for well-done roasts. The final internal temperatures reached were 61°, 68°, and 75°, respectively.

The rise in temperature of roasts after removal from the oven was found to vary inversely with the internal temperatures which the roasts had reached at the time of removal. For roasts removed at 75°, the rise was only 2°, while for those removed at 51° the average rise was 10°. At different oven temperatures for roasting it was found that for the same degree of final doneness the higher the oven temperature the lower should be the internal temperature at the time of removal. The lower oven temperatures of 110 to 125° gave a greater uniformity of doneness through the roasts, as shown by smaller differences in temperature at various points in the roast than for those cooked at 150° and 175°. The average total loss (drippings and evaporation) was 16.8 per cent for roasts cooked to the rare stage and 22.3 per cent for the well-done roasts. "Losses due to evaporation were consistently higher for the medium and well-done roasts also, but the drippings loss showed higher for the rare roasts. This is attributed to the fact that all the rare roasts were from much fatter steers and the fat loss to the drippings was much increased. The greatest variation in loss was found to be in the evaporation of moisture and other volatile substances with increase in degree of doneness, average being 8.08 per cent for the rare roasts and 14.9 per cent for the well-done roasts, an increase of some 84 per cent of evaporation loss. It would seem advisable from the standpoint of economy of losses to cook the meat to as rare a stage of doneness as is palatable."

To determine the effect of the oven temperature upon losses, pairs of roasts after preliminary searing at the same temperature were cooked to the same degree of doneness at different oven temperatures, including 110°, 115°, 125°, 150°, and 175°. Total losses and evaporation and drippings losses increased with increased oven temperature. The color and flavor of the drippings were more desirable at the higher temperatures, but on account of the greater losses the medium-done roast (removed at 61°, with a maximum of 68°), cooked at an oven temperature of 125°, was considered the product having the maximum desirability of flavor and color, with the minimum amount of loss in drippings and by evaporation.

The average time per pound for beef roasts cooked at 125° oven temperature was calculated to be 14.19 minutes for rare, 16.44 for medium done, and 22.91 minutes for well-done roasts. Including the average additional time for the roasts to reach the maximum temperature after removal from the oven, these times become 17.89, 20.84, and 25.41 minutes per pound. At other oven

temperatures the average time per pound for medium-done roasts is given as 20.75 minutes for an oven temperature of 110°, 19.08 minutes for 115°, 16.44 minutes for 125°, 13.29 minutes for 150°, and 12.83 minutes for 175°.

The standard method of roasting beef adopted by the national cooperative committee is included.

Roast beef: Rare, medium, or well done, E. LATZKE (*N. Dak. Agr. Col. Ext. Circ. 96 (1930), pp. 7, fig. 1*).—This circular contains practical directions for roasting beef, based upon the research findings noted above.

Further improvements made in Illinois-wheat bread (*Illinois Sta. Rpt. 1930, pp. 270–272, fig. 1*).—In continuation of the baking studies on wheat flours milled in Illinois, the four flours previously tested (E. S. R., 62, p. 290) were tested again by R. A. Wardall and A. M. Schreiber and a new variety, Fulhio, was added. Fulhio, although a distinctly soft wheat, produced bread superior to Ilred in volume, texture, grain, and loaf shape. The breads from the Ilred and Michigan Amber wheats were less satisfactory than in the previous tests. The percentages of water absorption by the different flours were somewhat lower in 1929–30 than in 1928–29.

All of the breads were improved when skimmed milk was used for liquid in place of water, the improvement being most noticeable in the color.

The relation of food to the growth of pre-school children, M. A. BROWN (*Ohio Sta. Bimo. Bul. 149 (1931), pp. 73–76*).—Information concerning the diets of 114 children under observation in the previously noted investigation of seasonal variations in the rate of growth of preschool children (E. S. R., 64, p. 693) was obtained from the mothers or guardians of the children in monthly reports for a period of at least one year for each child and for two years for 22 of the children. The children were divided into two groups based on different economic levels. Of these 100 were members of families having at least an average income and 14 of families of a lower economic level. More than four-fifths of the children in the first group attended nursery school or kindergarten during a part of the year. The diets of the children in this group scored from 80 to 100 and those of the smaller group from 60 to 80 according to the score developed by Frayser (E. S. R., 62, p. 289). The principal differences in the diets of the two groups were in milk, most of the children in group 1 receiving a quart a day and in group 2 only about a pint; in fruits, particularly orange or tomato juice, which were taken more regularly by the children in the first than in the second group; and in cereals, which were used in larger amounts in the second than in the first group.

The children in group 1, whose diets were considered fully adequate, made an average yearly gain in height of 2.75 in. and in weight of 5.07 lbs., while those in group 2, whose diets were considered only fairly adequate when measured by the same score, made an average yearly gain in height of 2.57 in. and in weight of 3.63 lbs. Since even this group made the average expected gain in weight, the benefit of optimal v. adequate nutrition seems to have been demonstrated by the greater gains in the first group.

Factors affecting the seasonal variation in the growth of children (*Kansas Sta. Bien. Rpt. 1929–30, pp. 133, 134*).—In this final progress report of the study noted previously (E. S. R., 61, p. 191), the monthly gains in weight of the 59 children serving as subjects during the school year 1928–29 are summarized for the three groups receiving, respectively, no treatment, light treatment, and orange treatment. As judged by the total gains in weight of the three groups, the two forms of special treatment were without effect upon gains in weight. Seasonal variations in growth occurred in all the groups, growth being more rapid in the fall months than in the months of January and February.

Simple, fadless diets safely reduce body weight (*Illinois Sta. Rpt. 1930, pp. 273, 274*).—In this progress report on studies by H. T. Barto and S. C. Munger on the effect of modified diet and controlled exercise on body weight and physical fitness of overweight women, it is stated that "preliminary results suggest that weight can be safely reduced by simple, well-balanced diets readily available at ordinary eating places and that it is not necessary to resort to extremes in food selection in order to get a steady and reasonably fast loss in weight." This conclusion is based upon nitrogen and basal metabolism determinations conducted for a period of 3 weeks on three overweight subjects who were under strict dietary and exercise régime, and observations for 27 additional weeks on two of the subjects while living upon a diet chosen from meals served at one of the university residence halls. The weighed diets furnished approximately 1,000 calories and 55 to 60 gm. of protein daily. The basal metabolic rates ranged from −12.3 to −18.1 per cent (Aub-Du-Bois standard). Of the two subjects continuing on the diets, one lost 32½ lbs. in 25 weeks and the other 64⅛ lbs. in 24 weeks. It is stated that at no time did the subjects suffer loss of strength or complain of any discomfort, and no impairment of physical efficiency resulted.

The utilization of calcium and phosphorus from various forms of milk (*Kansas Sta. Bien. Rpt. 1929–30, p. 135*).—This is a brief progress report on three phases of the general investigation by Kramer et al. of calcium and phosphorus metabolism under varying conditions (E. S. R., 60, p. 593). In the first study 10 college women, 5 of whom received ultra-violet radiation daily, were given a simple mixed diet, the greater portion of the calcium of which was furnished by raw milk for the first 9 days and by ice cream made with condensed skim milk for the remaining 9 days. All of the subjects utilized the calcium of the ice cream as well as of the raw milk, and those who were irradiated showed no better utilization than those not irradiated. The phosphorus balances followed the trend of the calcium balances.

In the second study 2 college women received the greater part of their calcium from raw milk for 11 days, followed by an equal number of days during which calcium and phosphorus were supplied in inorganic form. Casein constituted most of the protein of the diet. The inorganic calcium appeared to be utilized as well as that of the raw milk.

In the third study 2 school children receiving the greater portion of their calcium from raw milk were given added doses of viosterol during a second period. No differences were shown in the utilization of the calcium in the two periods.

[Vitamin studies in Illinois] (*Illinois Sta. Rpt. 1930, pp. 109, 110, 265–270, fig. 1*).—In a test by H. H. Mitchell and J. R. Beadles, 4 pairs of rats were fed after a preliminary feeding period to deplete their store of vitamin B on rations containing 30, 40, 50, and 60 per cent, respectively, of corn. One rat in each pair received 3 drops of tikitiki (an alcoholic extract of rice polishings) daily, while the control rat received an equal caloric intake of sugar. The food intake of each pair was kept the same. The results indicated that for the ration used the minimum amount of corn necessary to provide sufficient vitamin B for growth was about 40 per cent.

Quantitative determinations by R. A. Hetler and C. R. Meyer of the vitamin B content of tikitiki have shown that with autoclaved yeast as a source of vitamin G 1 or 2 drops daily of the tikitiki suffice to maintain life in the experimental rats over an extended time, 3 drops daily are sufficient for resumption of growth at a satisfactory rate, and in the absence of autoclaved yeast good growth results on 6 and 12 drops daily of the tikitiki as the sole source of both vitamins B and G.

Earlier studies on the distribution of vitamins B and G in cereal grains (E. S. R., 62, p. 390) have been extended to yellow corn and oats. In testing for vitamin B, autoclaved yeast was used as the source of vitamin G and in testing for vitamin G tikitiki was used as the source of B after a preliminary depletion period. Vitamin G was found to be the first limiting factor in whole yellow corn, but vitamin B was also found lacking. Only when corn constituted as much as 25 per cent of the diet did it furnish enough vitamin B for satisfactory growth, and even at this level neuritic symptoms developed. In the vitamin G tests 3 drops of tikitiki were given daily, and the corn to be tested was autoclaved in order to destroy its content of vitamin B. On 25 per cent autoclaved corn, growth was far below normal and pellagrous symptoms developed. On increasing the corn to 50 per cent of the diet the pellagrous symptoms were cured and marked growth resulted.

To determine the adequacy of yellow corn for meeting the requirements of lactation, Hetler and M. Plant fed whole yellow corn and yellow corn germ to lactating rats to the extent of 50 and 40 per cent of the diet both as the sole source of vitamins B and G and of vitamin B alone. The rats grew and reproduced, but could not raise normal young when the corn or corn germ was relied on to supply both vitamins B and G. When autoclaved yeast was added. normal young were raised on the whole corn diet but not on the corn germ diet. In the absence of autoclaved yeast the corn germ diet appeared to be superior to the whole corn from the standpoint of lactation but not of growth. A form of tail and toe infection was present in many of the young soon after birth, but usually disappeared when the animals were about 3 weeks old.

A continuation by Hetler and Meyer of earlier studies on the distribution of vitamins B and G in oats has substantiated the earlier findings that oats are richer in vitamin B than in G. When oats or oat products are relied upon as the sole or principal source of vitamin B, the foods must make up at least 25 per cent of the diet and of vitamin G 50 per cent of the diet. It was found that a low level (10 per cent of the diet) of oats as the sole source of vitamin B, when adequately supplemented with all of the other known essentials for growth, supported remarkably good growth for about 20 days, but that for growth 100 days or longer a higher level, 25 per cent or more, was necessary. Records of food intake and growth indicated greater metabolic efficiency in the animals receiving an adequate amount of G in the form of autoclaved yeast.

A study by Hetler, Meyer, and D. Hussemann of the relative need of vitamins B and G for lactation has led to the conclusion that "increased quantities of vitamin G are more likely to produce successful lactation than are increased quantities of vitamin B when either of them is added to a diet which contains both at a level sufficient for growth." In the studies leading to this conclusion adult female rats were given a diet consisting of adequate protein, carbohydrate, minerals, and vitamins A, D, and E, with 5 per cent of yeast or 50 per cent of oats as the source of vitamins Band G. To this diet tikitiki was added as an additional source of B and autoclaved yeast as a source of G, respectively.

The addition of 15 per cent of autoclaved yeast to either of the diets produced successful lactation. Tikitiki in amounts up to 6 drops daily did not give as good results as did the autoclaved yeast. The addition to the 50 per cent oats diet of milk or egg yolk, good sources of vitamin G, gave as good results as did the autoclaved yeast as far as weight was concerned.

A determination of the vitamin content of some common fruits and vegetables (*Kansas Sta. Bien. Rpt. 1929–30, pp. 134, 135*).—In this progress

report, in addition to findings noted by Kramer et al. from another source (E. S. R., 62, p. 397) further data are reported briefly on the content of vitamins A and D in cherries (E. S. R., 61, p. 193). Early Richmond cherries grown near Manhattan in 1927 and 1929 and canned by the cold pack process were found to be rich in vitamin A. Montmorency sour cherries grown and canned in 1929 showed a similar richness in vitamin A. Negative results were obtained in the vitamin D tests.

The action and identity of antirachitic vitamin (*Iowa Sta. Rpt. 1929, pp. 62, 63*).—*Continuing previous work (E. S. R., 61, p. 301), "biochemical observations, designed to follow changes in the microscopic life of the digestive tracts of groups of rats, were made over periods of vitamin deficiency and vitamin* D therapy. Determinations of ferric oxide reduction, an indicator of anaerobiosis or the kind of bacterial growth, and turbidity of suspensions of feces, an indicator of total bacterial growth, were made simultaneously with determinations of alkalinity.

"It was found by changing the animals from a complete vitamin-containing diet to a vitamin-deficient, high calcium, low phosphorus corn ration, that the reduction, turbidity, and alkalinity were temporarily increased, then actually lowered. These unexpected results seemed to show that the intestinal bacterial growth was decreased on account of a new medium being created by a different diet. In a few days, however, the alkalinity, ferric oxide reduction and turbidity rose to a level much higher than that produced by the initial vitamin containing diet as if anaerobic alkalinity producing bacteria had started growing in the digestive tracts. Continuation of the animals on the vitamin deficient diet only yielded slightly higher and more constant figures for alkalinity, anaerobiosis, and turbidity and finally led to rickets and skeletal failure unless vitamin D was added. In that case the reduction and alkalinity decreased and a decrease in turbidity followed.

"In the light of these findings and the work of other investigators who have found that high intestinal alkalinity generally accompanies vitamin D deficiency and rickets, and that bacteria growing with a reducing mechanism can produce alkalinity, it seems possible that this vitamin restricts, somehow, the alkalinity-producing micro-organic life of the intestinal tract."

Irradiation of school-children, L. HILL and A. R. LAURIE (*Lancet [London], 1931, I, No. 4, pp. 182, 183*).—The investigation of Colebrook on the effect of systematic ultra-violet radiation of school children (E. S. R., 62, p. 593) is criticized on the ground that the school selected was in a section of London where the light conditions were unusually good and the irradiation was probably too intensive.

In contrast with the negative results reported by Colebrook, favorable results reported by other investigators are summarized and a brief report is given of equally favorable results obtained in a controlled investigation conducted by the authors in the industrial town of Derby.

A random sample of 100 children was taken from each of four areas in the town, and from these children four groups were selected of 25 children from each area. The children were all between 9 and 12 years of age, and the test extended over 16 weeks, from November, 1929, to March, 1930, with a break of 2 weeks at Christmas. Group 1 was given radiation 6 ft. away from a long flame tungsten cored carbon arc with a maximum exposure of 10 minutes back and front. The dosage was about one-tenth the maximum dose used by Colebrook and was given twice weekly instead of 3 times as in Colebrook's study. Group 2 was given one radiostol pellet daily, with a

vitamin D dosage equivalent to about 2 oz. of a good cod-liver oil. Group 3 received similar pellets, with no irradiated ergosterol, and was irradiated by exposure to an arc fitted with a glass screen. Group 4, serving as controls, received no treatment. The children were given physical examinations at the beginning and end of the treatment. A total of 250 went through the entire period, and from the data obtained with these the following deductions were drawn:

The weight gains for the four groups in the order noted above were 2.42, 2.17, 1.81, and 1.91 lbs., respectively. Improvement was noted in children having diseased tonsils and glands in a few of the subjects in the first two groups but not in the other two. In liability to winter complaints such as colds and bronchitis, the percentage improvement in the four groups was 30, 21, 15, and 7 per cent, respectively. The percentages of children who showed improvement in any form were 80, 47, 34, and 24.

In general group 1 showed in every respect slightly better results than group 2, and the improvements in these two groups over the others were in all cases by an appreciable margin.

TEXTILES AND CLOTHING

The protective value of certain clothing fabrics (*Kansas Sta. Bien. Rpt. 1929–30, pp. 135, 136*).—This progress report includes, in addition to a summary of the results of the relative protective value of clothing fabrics against heat loss when air is in motion (E. S. R., 63, p. 697), a brief report on the effect of fitting and of the nature of the surface of the fabric on the protective value of different fabrics.

It was found that when the covering was fitted tightly the average protective ratio was 1.15 with the napped side of Canton flannel inside and 1.24 outside. When the covering was fitted ⅛ in. larger than the body the protective ratios increased to 1.4 and 1.44, respectively, and ¼ in. larger than the body to 1.53 and 1.55 respectively. These differences are explained as follows: "When fitted tightly the nap becomes pressed down, thus decreasing the amount of air held in the interstices of the fabric. As the layer of air between the covering and the body increases, the transfer of heat from the body through the fabric covering decreases."

HOME MANAGEMENT AND EQUIPMENT

[Investigations in home management at the Illinois Station, 1929–30] (*Illinois Sta. Rpt. 1930, pp. 272, 273*).—An analysis was made by R. A. Wardall, M. A. Souder, and R. C. Freeman of 18 home account books of small-town families and 67 of farm families in 18 counties of the State. Farm families with incomes of $1,000 to $2,000 showed little change in expenditures with increase in size of family. With incomes of $2,000 to $3,000, savings decreased and expenditures for food, clothing, and general purposes increased as size of family increased. Food cost averaged $638 per family, of which $401 worth was contributed by the farm. The average cost of clothing was $46 for husbands, $68 for wives, $31.46 for children under 6 years of age, $37.98 for children from 6 to 14 years of age, and $70.64 for children from 14 to 18 years of age. Clothing expenditures for husbands remained nearly constant for the $1,000 to $2,000 income group, regardless of size of family. Clothing expenditures for wives decreased from approximately 130 per cent of that for husbands where there were no children to 64 per cent in families of 5. In the $2,000 to $3,000 income group, clothing expenditures of wives were approximately double that of husbands, and each decreased in like proportion as the number in the family increased.

A comparison of cooking equipment for the farm home (*Kansas Sta. Bien. Rpt. 1929–30, pp. 136, 137*).—Comparative tests of cooking equipment showed that for gas stoves the efficiencies, lengths of time, and amounts of fuel vary with the gas pressures used and the rates at which the gas is burned.

Application of electricity to the farm home (*Iowa Sta. Rpt. 1929, pp. 66, 67*).—Laboratory equipment designed to assure accurate control of experiments was used in a series of experiments with many fruits and vegetables. All were cooked uniformly, retained a natural flavor, and showed a marked economy in time and current consumption.

In a study made of factors involved in the design of a mechanical washer for kitchen utensils, it was found that the sprays used in the present dishwashers had little effect upon pots and pans. Nozzles were constructed which would give flat, controlled jets; experiments were made with these nozzles, using water at different pressures and temperatures, and with the jets directed against the pans at various angles.

"The results show definitely that a flat water jet working under a pressure of 10 lbs. and making an angle of 30 to 60 degrees with the pan would remove any of the common soils from a cooking utensil in a few minutes."

MISCELLANEOUS

Report of the director [of Connecticut State Station] for the year ending October 31, 1930, W. L. Slate (*Connecticut State Sta. Bul. 322 (1931), pp. 109–150, figs. 10*).—The work of the station during the year is briefly reviewed. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Report of the Guam Agricultural Experiment Station, 1929, C. W. Edwards et al. (*Guam Sta. Rpt. 1929, pp. [2]+20, figs. 8*).—This contains reports of the director, the assistants in poultry husbandry and agronomy and horticulture, and the entomologist, and meteorological observations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

A year's progress in solving farm problems of Illinois: [Forty-third Annual Report of Illinois Station, 1930], compiled and edited by F. J. Keilholz (*Illinois Sta. Rpt. 1930, pp. 296, figs. 53*).—This contains the organization list, a summary of the work, and a financial statement for the fiscal year ended June 30, 1930. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Annual Report [of Iowa Station], 1929, C. F. Curtiss and W. H. Stevenson (*Iowa Sta. Rpt. 1929, pp. 71*).—This contains a report on the work of the station, including a financial statement for the fiscal year ended June 30, 1929. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

[Report of Kansas Station, 1929–1930], L. E. Call (*Kansas Sta. Bien. Rpt. 1929–30, pp. 164, figs. 2*).—This contains the organization list, financial statements for the biennium ended June 30, 1930, and a report of the director summarizing the work and publications of the station. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Biennial Report of the Missouri State Fruit Experiment Station, Mountain Grove, Mo., 1929–1930, F. W. Faurot (*Missouri Fruit Sta. Bien. Rpt. 1929–30, pp. [12]*).—This contains a financial statement for the fiscal biennium ended December 31, 1930, and a report of the director discussing the needs of the station during the ensuing biennium. The experimental work reported is for the most part abstracted on page 839 of this issue.

NOTES

Louisiana Stations.—An animal pathology plant known as the Dalrymple Memorial has been completed. This includes a small one-story building which will be used for housing experimental animals and a two-story building for teaching and research.

Michigan College and Station.—George E. Starr, research associate in horticulture and horticultural specialist in extension work, resigned effective March 1, and will be succeeded on June 15 by Charles H. Mahoney of Texas Technological College.

Minnesota University and Station.—Facilities for research with textiles have been greatly improved by the provision of a conditioning room in the home economics building. This room, 9 by 18 ft. in size, is equipped with a "carrier conditioning unit" and other apparatus used for research and tests requiring constant atmospheric conditions. This equipment has been provided at a cost of approximately $3,000. A small research laboratory equipped for microscopic examinations and studies of biological processes has been added to the equipment of the poultry division.

Dr. E. C. Stakman, professor of plant pathology and plant pathologist, who is on sabbatical leave for the year, was guest professor for the six months October to March at the University of Halle, where he gave two courses of lectures in plant pathology. Subsequently he has been engaged in a survey of plant diseases affecting rubber trees in the East Indian Islands. He is expected to return to Minnesota about July 1.

Dr. A. A. Granovsky has accepted an appointment in the division of entomology and economic zoology in the university and station.

West Virginia University and Station.—The first milk and ice cream short course enrolled nine dairy plant operators and assistants in a 10-day session, and 50 others attended on visitors' day. A similar course is contemplated for 1932.

A modern radio receiving set has been installed for student use in connection with broadcasted programs of an agricultural nature. It is felt that many lectures will be heard in this way which will provide helpful information on farm subjects.

Sixty farmers in eight counties in the Parkersburg area are cooperating with the station, the extension division, and the demonstration poultry plant in a study of the costs, profits, and best practices of producing poultry and poultry products under varying farm conditions.

New projects undertaken by the station include investigations by the departments of agronomy and horticulture of the responses of farm crops to various fertilizers. The Lakin Experiment Farm is being utilized for experiments as to (1) general fertility with a three-year rotation of corn, wheat, and clover, (2) the method of applying fertilizers in this rotation, (3) a rotation of corn, soybeans, wheat, and clover, (4) fertilizers applied to different crops in this rotation, (5) fertilizers when potatoes are a part of the rotation, (6) the value of fertilizers and cover crops in a potato-soybean rotation, and (7) the place of organic matter in rotations of corn and wheat, with and without sweetclover as a cover crop, and corn, wheat, clover, and timothy.

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